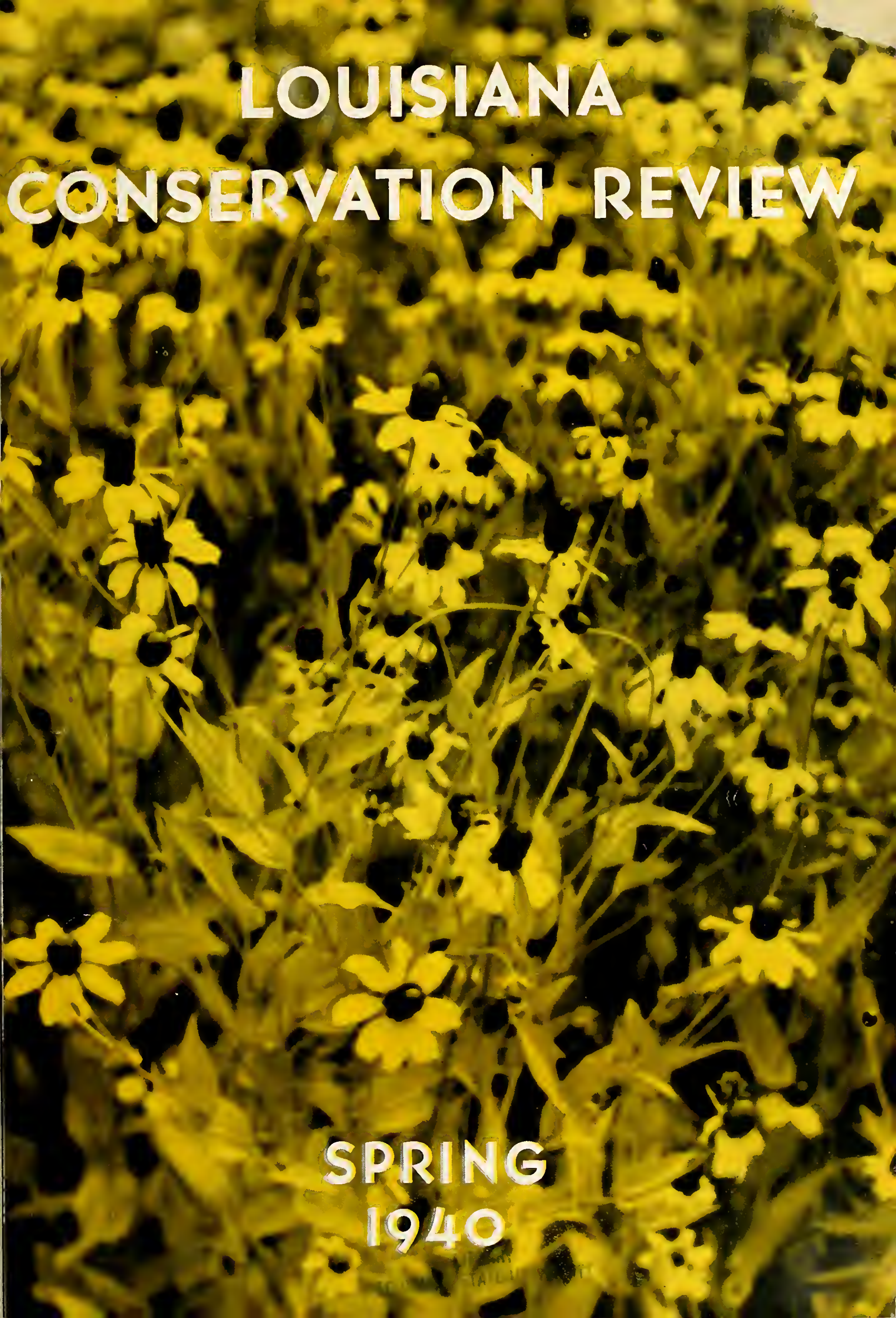
LOUISIANA CONSERVATION REVIEW



SPRING
1940

This Louisiana doe appears to be startled—

But she need have no fear. She is protected by the close season on does and fawns, even if Mr. Buck should fall a victim to the sportsman's gun.

There is more to the conservation of our wildlife than open and close seasons on game, however. Besides our hunters and fishermen we have to consider our people as a whole, their varied recreational diversions and the aesthetic values of our wildlife species.

For example, many of our hawks and owls are more valuable than some song and insectivorous birds. Others, such as eagles, herons, cranes, pelicans, buzzards—in fact, most of our large birds—are really important because of their recreational and artistic interest.

The true sportsman is not only in sympathy with restrictive regulations to insure a continued supply of our migratory waterfowl and other game—he is glad to co-operate with the constituted authorities in the protection of wildlife species that have no food or sporting value.

DEPARTMENT OF CONSERVATION

126 Civil Courts Bldg.,
New Orleans, La.

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Gift
La. Coll.

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■ **Front Cover—From the photograph of a field of Black-eyed Susans, by Percy Viosca, Jr., who writes on "Spring-time in Louisiana" in this issue.**

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—*Swinney Studio*

SAM HOUSTON JONES

inaugurated governor of Louisiana on May 14, 1940

YOUNG SAM'S DREAMS COME TRUE

by Sam Mims

ILLUSTRATED BY ROY ODOM

A photograph of Sam H. Jones of thirty years ago could have supplied Norman Rockwell a proper model for his famous paintings. Like thousands of other farm boys, Sam began his outdoor sports by fishing in a brook with a red worm dangling from a bent pin that depended from a cord string, one end of which was tied to a cane pole. A photograph of him at that time would have disclosed a straw hat, the brim of which was badly frayed; it would have shown ten stubby toes, scarcely visible under the flopping legs of denim overalls, and it would have presented the true-to-life picture that brought fame to Rockwell and classed him as one of America's great illustrators.

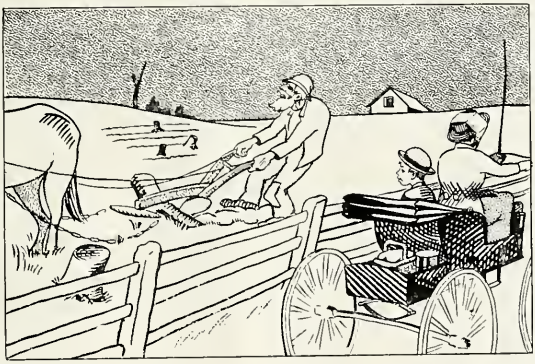
Sam was one among thousands of Louisiana farm boys, with nothing particularly to distinguish him. He shared with many others the thrilling experience of twisting rabbits out of hollow gum trees. Old men in the neighborhood seemed never to tire of recounting tales of deer and bear hunting in the early days, but Sam had to be content with learning to pull rabbits from their dens by the dextrous use of a forked stick.

Beauregard Parish was a good place for a boy to be reared. Here was an area of pine-covered forests, and not very far to the south were sections of lowlands that were thick with cypress trees. If a young man in this vicinity wanted to see wealth pouring out of the ground he could drive to the gas-oil fields within an hour, or, if he wanted to spend a day at fishing he could choose between fresh and salt water lakes, bays, and lagoons to the south.

Perhaps hard work and many duties caused Sam to concentrate on things more serious than hunting and fishing.

One day he and his mother were driving to town. It was springtime. Birds were singing, bees were humming. Young Sam was happy, seated in the old buggy, talking to his mother, and clucking to the horse, not knowing that a few minutes later his spirits would be cast into the depth of gloom.

They came to a new field, one in which the soil had never before been disturbed. An old man was trying to plow this untamed land. Stubborn roots hidden in the soil made the task very strenuous, toil entirely too severe for the aged man.



This was a sad picture to young Sam, and it made deep impressions upon him. For a long time he sat silent, gazing ahead, unmindful of the grating sound of the iron tires against gravel. At last he said, "Mother, I'm going to be governor some day, and I'm going to fix it so old men like that won't have to do such hard work."

Late in the autumn of each year this farm lad saw myriads of wild geese and ducks in passage to their sanctuaries along the Gulf coast, and before the blush of the following spring he saw them returning to their northern breeding places. At his mother's knee he listened to readings of the Old Testament, and from the books of Job and Numbers learned of the manner in which migratory fowls saved the wandering tribes of Israelites in the wilderness country and of how Job and Jeremiah observed the habits of these birds. He knows now, as Governor of Louisiana, that although men have been, for more than thirty-five hundred years, studying wildlife, that we are daily finding more interesting lessons to be learned from them. As an ardent member of the American Legion he has encouraged Boy Scout units toward a zealous comprehension of wildlife.

Growing to manhood in a part of the State that is in close proximity to oil fields, Sam H. Jones understands the problems of stream pollution, caused by salt water and poisonous residue flowing from producing areas. He knows how difficult it is to find the proper line of demarcation between gas-waste and gas-service incident to the production of oil. As a lawyer he has studied the various conflicts that arise between landowner and producer. He knows how hard it is to satisfy all concerned in the petroleum business with restrictions and allocations incident to sane conservation of gas and oil.

Now that he is Governor Sam H. Jones instead of a barefoot farmer boy, now that his prophetic challenge has become a reality, his thoughts go back to that long-ago morning when he said: "Mother, I'm going to be governor *some day*, and I'm going to fix it so old men like that won't have to do such hard work." *Some day* has come and it has brought many problems just as pathetic and serious as he saw on that occasion when he was driving to town with his mother.

One of the most important functions of state government concerns the Department of Conservation. With our mammoth production of gas and oil, with our many sanctuaries for wildlife, and with our commercial fisheries, we have a wealth of natural resources that must be used with care. Governor Sam Jones knows the commercial value of products that come from nature's lavish storehouse, and he knows the aesthetic and recreational importance of wildlife.

Our First Lady is also concerned with conservation, believing that places of recreation are beneficial to the youth of our State. "Boys and girls should be encouraged to study wildlife," she said. Then obviously concluding that she must become a disciple of her own doctrine, quickly added, "Sam and I will have to spend our recreational hours in the woods with our children. My boys are getting old enough to learn to fish and hunt, and we want them to get first-hand knowledge of birds and animals."

Mrs. Jones likes to talk about the treaties that have been entered into by and between the governments of Mexico, Canada, and the United States for the protection and preservation of migratory birds. "Just to think of international treaties to safeguard birds! A meeting of the minds and the hearts of the officials of three great North American countries—not the signing of a mere 'scrap of paper' that gives false promise of protection to human life, but a sincere agreement that denizens of the air will be treated kindly by the peoples of these countries." This official act is a manifestation of the importance of all wildlife, to which our First Lady adds her sanction by saying, "Yes, indeed, I want our children to love the forests and streams and the wildlife that inhabits them."

And so, it shouldn't surprise any of us to find the Jones family, some week-end, camped on the shore of one of our beautiful lakes or along the borders of some meandering stream, for Mrs. Jones, like all good mothers, responds to her convictions. If her family can be benefited by frequent sojourns to the forests, to the forests they will go. The fish may not bite and the mosquitos may be ravenous, but she'll be smiling. And the Governor, too, will be happy, sitting there on a cypress stump and perhaps quoting James Whitcomb Riley to her:

> "It's the songs ye sing and the smiles ye wear
> That's making the sunshine everywhere."

◆

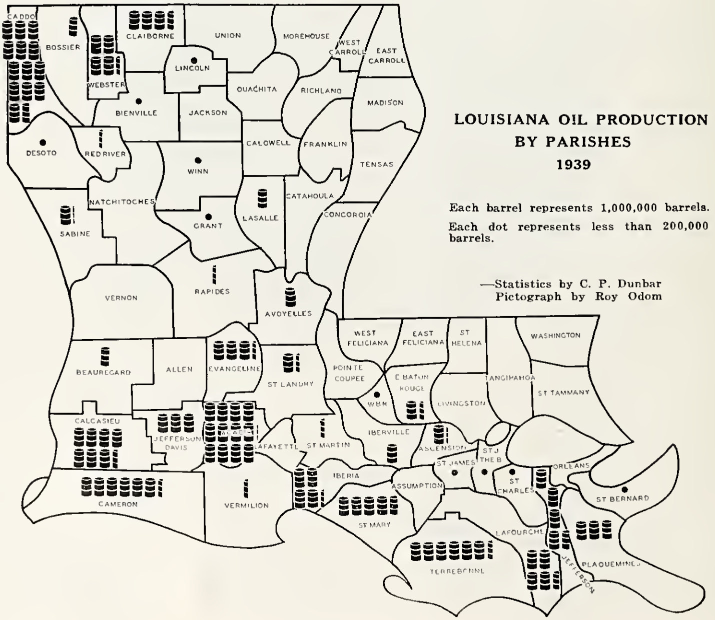
Perhaps without banding records, ornithologists would not know that the redhead duck migrates east and west, and vice versa, not north and south, as do most migrants.

Fish was regarded as a rare delicacy by the ancient Romans, some of whom paid as high as $1,200 for a single mullet.

The Sea Otter which has been hunted along the Pacific coast until nearly exterminated has furnished the most valuable pelts of any animal in America. Both male and female are alike in appearance and they have never been known to be polygamous. The young are born in the kelp beds of the ocean with only one to litter and do not reach full growth until the fifth year of their existence. The mother sleeps on her back in the water with her baby clasped in her fore paws, and if it should become separated from the mother, the pup does not live very long. Their food consists of crabs, clams, fish and some portions of the kelp wood.

FISHERY BIOLOGY—400 B. C.

"These (the fishes) were made out of the most entirely ignorant and senseless of beings, whom the transformers did not think any longer worthy of pure respiration, because they possessed a soul which was made impure by all sorts of transgression; and instead of allowing them to respire the pure and subtle element of air, they thrust them into the water, and gave them a deep and muddy medium of respiration; and hence arose the races of fishes and oysters, and other aquatic animals, which have received the lowest habitations as a punishment for their extreme ignorance." Plato.



**LOUISIANA OIL PRODUCTION
BY PARISHES
1939**

Each barrel represents 1,000,000 barrels.
Each dot represents less than 200,000 barrels.

—Statistics by C. P. Dunbar
Pictograph by Roy Odom

Major Hardey Looks Ahead At the 'Golden Age' of Louisiana

Louisiana's new commissioner of conservation, Major B. A. Hardey of Shreveport—described by Governor Jones as an oil man who knows the business from the "bottom up"—has rather definite ideas as to the future of the industry in this State.

Major Hardey's present task is that of reorganizing the Conservation Department's varied activities, but he is also concerned with some of the broader aspects of the work and he has taken "time out" to outline his views for the Review. He says:

"While I have always been impressed with the importance of conservation as a constructive public policy, I am particularly interested in the conservation of our petroleum resources, not merely because I have been associated with the oil industry most of my adult life, but because our petroleum resources are not inexhaustible—they cannot be restored or replenished, as our forests and fisheries, even our wildlife. But they may be conserved, their power may be amplified by science, their life may be extended and their production wisely administered for the benefit of all of our people.

"Let us consider Louisiana's potential production. Present estimates of our proven reserves are around one billion barrels of crude oil, which means a value of approximately one billion and a quarter million dollars at the well during the next decade. But we must bear in mind that new cracking and other processes of refinement are being constantly discovered and improved, so that it is reasonable to assume that the value of the crude will advance with that of the refined products.

"Now we will be short-sighted indeed if we merely look at the returns from our severance tax and royalties from state-owned lands. Rather, we should regard the next decade, which we are just now entering, as our 'golden age' of opportunity, for it means that we will have here in our midst a liberal, progressive group of men whose good will we may either win or lose, whose activities may be converted into an asset or a liability by our own attitude and policies.

"We must recognize the fact that while the oil industry itself may be transitory, moving from one part of our country to the other as new areas are explored and developed, the enterprise and vision of the men who make up the industry—those intangible qualities of the individual, the genius and resourcefulness that are the spirit of our 'American way'—these qualities may be encouraged to remain with us and contribute to the continued upbuilding of our State.

"What I mean to say is that in the immediate years ahead of us the forward-looking men of the oil industry will be on the ground here in Louisiana. They will not only contribute to our welfare and prosperity by the employment of labor, the purchase of materials and the payment of taxes—they will be brought in close contact with opportunities for permanent investment in agriculture, in industry and all forms of business enterprise. Let us make known to them, let us make them feel that we consider them a permanent acquisition, a part of our own life and its future. Then the permanent benefits from this great natural resource will not be wasted or dissipated, never exhausted."

These observations of Louisiana's new Conservation Commissioner suggest that the progressive men of the oil industry should be encouraged to participate in the continued upbuilding of the State, through investment in agriculture, industry and all lines of business enterprise, so that there will be permanent benefits from the development of our petroleum resources, after these may be exhausted.

The new conservation commissioner is a native of Louisiana, born in Evangeline Parish on October 19, 1893. He attended the University of Texas, but left college to enter the employ of the Gulf Refining Company, which he served in various capacities, from roustabout to scout. In 1925 he became associated with several oil companies as an executive—in 1932 he became an independent operator.

Major Hardey is Vice-President of the Independent Petroleum Association. He heads the Shreveport chapter of the Association and for the past year has been active in efforts to organize the South Louisiana independent oil men.

Major Hardey is president of the Business Council of Louisiana. He is past president of the Norwela Boy Scouts of America, past commander of the American Legion post of Shreveport, a former president of the Shreveport Chamber of Commerce. He was also instrumental in securing the Galveston (Texas) league baseball franchise for Shreveport last year and is one of the officers and directors of the club.

The title "major" is not an honorary one, but was earned in the U. S. Army during the World War, being retained through affiliation and membership in the Organized Reserves of the Shreveport division.

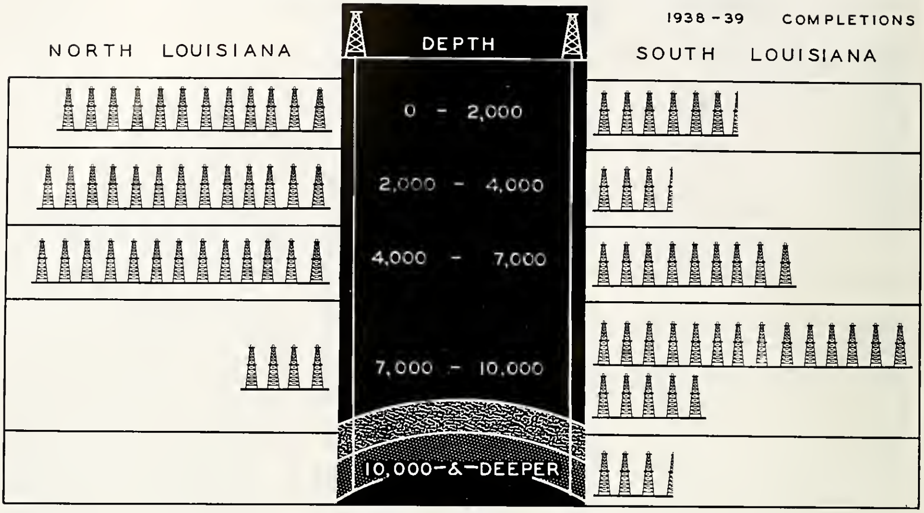
Major Hardey was married on Aug. 20, 1917 to Miss Louise Lachle of Shreveport. They have three children, B. A. Jr., Charles and Theresa.

Owing to his extensive business interests there was no small personal sacrifice involved in Major Hardey's acceptance of the post of Conservation Commissioner, but having been an active supporter of Governor Jones in his campaign he felt that it was his duty to assist in every way possible in making a success of the Governor's constructive program.

* * *

Louisiana stands first in the commercial production of shrimp, the annual catch being more than in all other coastal waters in the United States combined.

Contrary to popular belief the capacious bag with which the pelican's bill is provided is never used for the purpose of carrying fish. Fish captured by the pelican are swallowed, and if subsequently used to feed the young they are regurgitated by the parent bird.



OIL & GAS WELLS

GROUPED ACCORDING TO DEPTH

1938-39 COMPLETIONS

EACH SYMBOL REPRESENTS 20 COMPLETIONS

South Louisiana Continues Advance In Oil Production

by
Donald Goodwill, Jr.*

For the year 1939 Southern Louisiana continued to produce practically the same amount of oil that it did during the previous year—in the history of its development it must certainly be considered a successful year in that a total number of 843 wells were drilled, of which 555 were commercial oil producers and 28 were of the gas distillate type. While there was a substantial increase in drilling activity there were fewer new oil fields discovered than in 1938. The reason for this was the increased demand for crude oil; consequently more drilling in the already proven areas and less wildcatting.

The new fields discovered during this period were: Kenilworth, St. Bernard Parish; La Pice, St. James Parish; Paradis, St. Charles Parish; La Place, St. John the Baptist Parish; Lafourche Crossing, Lafourche Parish; Barataria, Jefferson Parish; Eola, Avoyelles Parish; Grand Lake, Cameron Parish; North Elton, Allen Parish; Vermilion Bay, Iberia Parish; Edgewood, Calcasieu Parish; Plumb Bob (Henderson), St. Martin Parish; Happy Town, St. Martin Parish; and West Gueydan, Vermilion Parish.

Of these discoveries nine were brought in as oil wells and five gas-distillate. However, in the case of some of the gas-distillate discoveries subsequent wells drilled in these areas have been oil producers, which often seems the case in fields in the Gulf Coastal Salt Dome Area. The Paradis field in St. Charles Parish, which was discovered by The Texas Company drilling in their number one Louisiana Land and Exploration Company well, located in section 39, Township 14, South Range 20 East, is one of the best examples of this development. This well was completed on June 26, 1939, with an initial production of 108 barrels of 54 gravity oil and 6,000,000 cu, ft. of gas, per day through a 16/64 inch choke. The well produced from perforations at 9895 to 9915 and was drilled to a total depth of 10787 feet. The second well which The Texas Company drilled on this same structure was their number 2 Louisiana Land and Exploration Company well which came in as a commercial oil producer on November 28 of the same year, and on a test made 862 barrels of pipe line oil and 660,000 cu. ft. of gas on a quarter inch chocke in 24 hours from perforations at 10292—10350 feet. This well was drilled to a total depth of 11169 feet.

This field is not only a major find for the year but also is considered as one of the important discoveries in coastal Louisiana. The structure itself appears to be very large and it seems that the oil bearing sands which are quite thick will be rather prolific. The ultimate recovery of this field of course cannot accurately be estimated at this time; however, with the known facts thus far obtained one should normally expect the field to produce in excess of 100,000,000 barrels of oil.

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*Petroleum Engineer, Department of Conservation.

In Southwestern Louisiana along the Gulf Coast one of the major discoveries was the Superior Oil Company's number 1 State Grand Lake well drilled in Cameron Parish. On a 24-hour guage this well made 437 barrels of pipe line oil with 200,000 cubic feet of gas on a 11/64 inch choke from perforations at 8365-8400 feet. The well was drilled to a total depth of 9179 feet. It is interesting to note that there were some ten different oil bearing sand bodies encountered in this well.

The outstanding discovery in South Central Louisiana was the Eola Field in Avoyelles Parish. This field was brought in with the drilling of the Sid W. Richardson—number 1 Haas Investment Company Incorporated well which was completed on January 16, 1939. On a 24-hour guage this well made 779 barrels of pipe line oil through a 1/4 inch choke from perforations at 8443-8550 feet. It was drilled to a total depth of 8581 feet.

THE WILCOX (TREND) PLAY

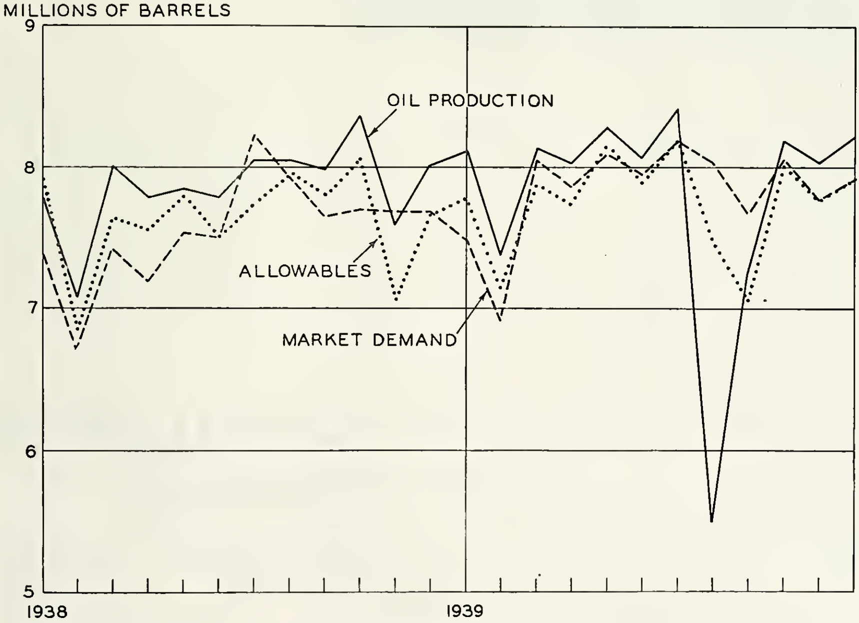
The Eola discovery was of tremendous interest to the Oil Fraternity for the reason that this well opened up Wilcox production in Louisiana and was the result of extensive drilling which had begun across the South Central portion of the State some eighteen months prior to the bringing in of this well. The major oil companies and independent operators had for a number of years held thousands of acres of leases in this section, most of them having been obtained shortly after the discovery of the Conroe Oil Field located in Montgomery County, Texas, some seven or eight years ago. Immediately after the Eola discovery was completed another intensive leasing campaign was under way in this area. Again the so-called "Conroe Trend" or the Wilcox (Trend) Play came into prominence. Soon after this the Continental Oil Company drilled their number 3 Hattie Haas well in the Ville Platte Field, Evangeline Parish, and this well was completed as the first Wilcox producer for the field.

During the year there were numerous new producing horizons found in already proven fields in the Gulf Coast. This of course added many barrels of reserves to those already known. Some of the fields in which new horizons were established are: Abbeville Field, Vermilion Parish; Charenton Field, St Mary Parish; Cheneyville Field, Rapides Parish; Creole Field, Cameron Parish; Port Barre Field, St. Landry Parish; Sweetlake Field, Cameron Parish; Woodlawn Field, Jefferson Davis Parish; and many others.

Geophysical prospecting in Southern Louisiana showed somewhat of a decline over that of the previous year. This no doubt was due to the discovery of oil in the State of Mississippi and also because most of our coastal region had already been canvassed fairly closely. The reflection seismograph method of prospecting continued to be the most important. At the close of the year there were 24 geophysical crews active in the coastal area.

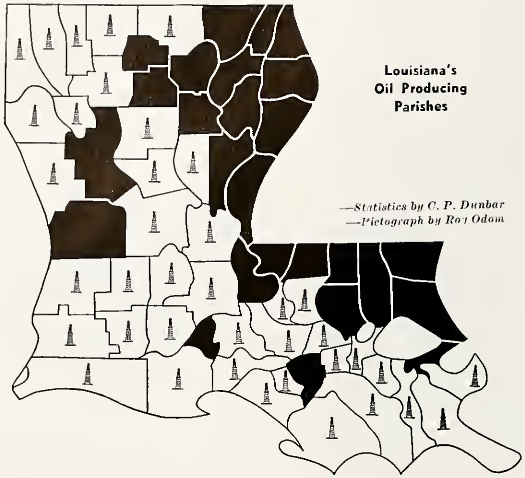
FOUR GASOLINE PLANTS

There were four gasoline plants operating in Southwest Louisiana at the end of the year. The Continental Oil Company had just completed a pressure maintenance plant, a crude oil de-salting unit, and a gasoline plant in the Ville Platte Field, Evangeline Parish. In the Tepetate Field, Acadia Parish, a similar plant



LOUISIANA OIL PRODUCTION 1938-39

Source: Production and allowables—La. Dept. of Conservation. Market Demand—U. S. Bureau of Mines.



Louisiana's Oil Producing Parishes

—Statistics by C. P. Dunbar
—Pictograph by Roy Odom

is operated by the Continental and in the Gillis-English Bayou Field, Calcasieu Parish, a gasoline absorption plant is operated by the same company. In the Iowa field, Calcasieu and Jefferson Davis Parishes, a gas absorption and repressuring unit is operatel by the Shell Oil Company.

It is certainly interesting to know that this type of field operation is at present being carried on in fields along the Gulf Coast and elsewhere in Louisiana for with operations of this nature the State will be able to get the maximum amount of yield from its oil producing areas. And we should by all means encourage this method of operation.

As the year 1939 closed the State's production continued to maintain practically the same level as that of the previous year, with a total production of 255,200 barrels per day as compared to 260,014 barrels per day for 1938. Of this amount South Louisiana produced 194,176 barrels per day as compared to 193,239 barrels per day in 1938. The total South Louisiana production for the year amounted to 68,424,047 barrels which was an increase of 1,951,665 barrels over 1938.

* * *

The Sanderling (a Louisiana bird) is known as the "globe-trotter" of the bird world because it is found at all ends of the earth.

Fish called Labyrinth Bubble-Nest Builders construct a floating nest of bubbles in which eggs, numbering from 100 to 500, are deposited, hatched, and the young tended.

WORLD CATCH OF FISH

According to the most recent information available, the world's annual catch of fishery commodities is about 35,000,000,000 pounds, valued at $761,000,000. The United States, including Alaska, with a production of 4,353,000,000 pounds, valued at $100,845,000, ranks first in the value of the fishery products harvested and is exceeded only by Japan in the quantity of the products taken. Japan, with a catch of approximately 8,107,000,000 pounds, valued at $100,807,000, is by far the largest producer of fishery products. Other countries whose annual commercial fisheries catch amounts to over 10,000,000,000 pounds annually are Canada, China, Chosen, England, including Scotland, Northern Ireland and Wales, Germany, Norway, and the Union of Soviet Socialist Republics.—Fisheries Service Bulletin.

DID YOU KNOW THAT—

The Mallard Duck, that has survived excessive hunting better than many other ducks, is an efficient mosquito control agency and has entirely eliminated mosquito larvae from many a badly infested pond?

The Marsh Hawk refueled in midair long before airplane pilots thought of it? The male will fly over his mate and drop a mouse that the female will seize long before it can touch the ground.

Sora Rails do not seem to have any great flying ability and yet travel from 2,500 to 3,000 miles on their spring and fall migrations?

EYES WRONG

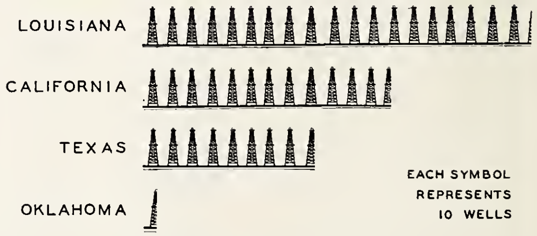
Although the fox is a member of the canine family and very much like a small dog, its eyes are cat-like . . . a dog's eye is very different from that of a feline . . it is more round in shape and has other differences.—American Wildlife.

Many snakes are important destroyers of insect and animal pests. (Apart from the poisonous species the least valuable of all snakes is the watersnake that has few redeeming characteristics. Frogs and young waterfowl are its common victims.

DOWN AND UP

In 1920 it was estimated there were 100,000,000 waterfowl in this country . . . a prolonged period of drought and other causes reduced the number to an estimated 25,000,000 in 1933 . . . at that time there were only 102 federal refuges of all sorts, which covered only some 6,000,000 acres . . . the refuge plan was speeded up by Uncle Sam and today there are 206 federal refuges, covering some 13,500,000 acres . . . and waterfowl numbers have increased to approximately 50,000,000.

LOUISIANA'S RATING IN WELLS DRILLED BELOW TEN THOUSAND FEET



SOURCE: THE OIL WEEKLY 1-29-40

SOFT CRABS --AND HARD

by Steve Benedict

■ **Yvonne Viosca demonstrates how to handle a crab.**

Leave every man to his trade. That's the way I'll start my story. If you think that you could skip away from your office desk for half a day's fun, once every other week, and compete catching crabs with someone to whom each crab means just that much bread in the family larder—well, then, pal, you're all wrong, just like a two-foot yardstick. I remark this because so many "sports" are just that way. They don't expect to repair their V-8's as good as the local mechanic, they don't expect to paint their houses as well as a professional painter, but they do expect to catch crabs as well as the professional crab-fisherman. Oh, don't tell me. I've run into more than one. And then when they're fooled, they blame it on—well, on anything but their lack of experience and common sense. Let's hope, however, that you're not of that kind, pal.

Then I'll just take it for granted that you're a regular guy—a "sport". You don't want to "hog" all the crabs along the lakeshore. All you ask for is a bit of fun, some country air, a balogna sandwich or two, a couple of bottles of beer and about half a hamper of hard crabs to take home for to-morrow's gumbo. If you get them it's O. K., and if they just didn't bite where you were, you aren't sore about that either. That's why I'm talking to you in the first place. We, who have dragged the lakeshore for a living, don't care so much about the other kind of "sport".

So let's go. I'll start off with the hards, and we'll begin school at the beginning. You take it into your head to go fishing crabs. Let's say you never did such a thing before in your life. You saw others do it and you heard tell of a good place or two; but that is all. In other words, you're virgin soil. That's the best material for scholars. People who have a slight, and often a wrong, knowledge of something learn a dern sight slower than those who know nothing and admit the same.

"Ike tells me that there's a new road goes down to Such-and-such Bayou, on The Lake," you remark to the wife, talking aloud your dreams. "He says old Schnitzlebloomer brought home four baskets of crabs from some place down that way. I always wanted to crab. What say we go in the morning? Pack the kids and the lunch and I'll get the beer to-night.'

The Mrs. looks up quietly, as all wives do in these cases.

"You'll need bait," she burst your pretty balloon.

You're entirely green at the game (let's assume so anyway). You straighten up in your easy chair and make a wry face at grandpa's picture on the opposite wall. "Huh!" you grunt. "Ike never said nothin' about bait. What'll we take?"

Out of her culinary wisdom your wife says simply: "Meat."

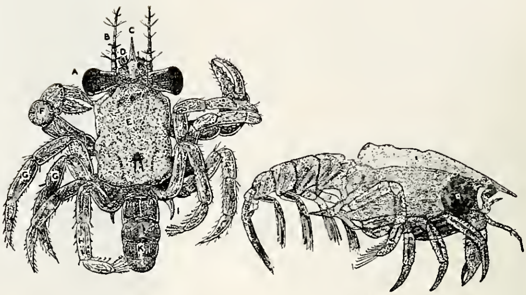
ADVICE FROM IKE

There are a few more words then a trip to the butcher shop and the Dutchman's on the corner. On the way home you drop into see Ike. He isn't such a hot crab-fisherman himself, but he's been there a time or two and that's a time or two more than you have. Ike talks a long time. He does know a little. You open a couple of the bottles. Together you weigh, argue and ponder the bait question, the "bait-al" values of liver, of pork, of fish, of hoofs and horns and odds and ends. Ike advices you sagely to buy some nets. "It's best," he says. "It's too late," you answer.

"Strings will have to do." By eleven P. M. you say good-night to Ike both of you knowing deep in your hearts that neither one nor the other knew much of what he was talking about. And that is why I want to give you, Mr. Starter, some hard-earned good advice.

Bait! Lord, how often I've heard the most old-time pro's argue about that. Some say the rottener it is the more they'll go for it. Others, just as good, tell you that's the bunk. All agree on one thing, however. The bait better be tough or there better be a helluva lot of it. A hungry crab is a veritable mangling machine. Fish is fine, but it's too soft. Chunks of gar attract them like free lunch attracts the bar-fly, but it doesn't last. If you must use fish, then get the small, tough, boney kind; mullet or croaker. Or better yet, stingaree—if you could (which I doubt). I've seen "sports" using even shrimp. Ouch! It's gone before the crab is on the surface of the water. Raw meat is excellent. Get tough, gristly stuff; skins, bones with stringy bits on them. Crabs fall for all that. But then crabs'll eat anything in the line of fish or meat—even other crabs, the cannibals.

Tying your bait to a string is O. K. enough, if you're pretty fast with a scoop net. Weight the string first, according to the depth, according to the current. Don't expect a crab to come to the surface to see whether you've got bait floating around there in the running water or not. Too, don't expect him to hang on while being dragged through fifteen feet of swiftly flowing water, ten feet of thin air and then slammed a couple of times against a creosoted bridge piling. He just won't, that's all. He'll let go long before he's on top of the water. So take it easy. Don't pull too hard and don't—please, don't—jerk. Otherwise you basket will be empty when you go home.



(*Courtesy of Dr. R. V. Truitt.*)

WHEN CRABS ARE VERY YOUNG

■ **This is the "megalops" stage of the crab, shown left in dorsal and right in lateral view. The crab is still only one-thirteenth to one-twenty-third of an inch wide. The following are the parts named: a. Compound eye; b. Antenna; c. Rostrum; d. Antennule; e. Carapace; f. Cheliped; g. Walking leg; h. "Paddle" or swimming leg; i. Cornu; j. Swimmeretes; k. Abdominal segments; l. Telson.**

Use light scoop net with meshes about one inch square and a handle that's not too long. Let the wire rim (nothing less than 3/8 inch rod is strong enough) be about twelve or fourteen inches in diameter. Buy one in your local hardware store. Scoop swiftly as soon as he's on the surface. Use a twist of the wrist and an upward movement of the arm; never downward, over the crab. Always under him. Slowly at first, then when the net's under the sonuvagun, quick, and he's all yours. Don't be stingy. Use a hard or medium laid #20 or #24 for your line. You can get all you want in the fishermen's supply stores around the French Market district. Don't save the grocery strings. It doesn't pay.

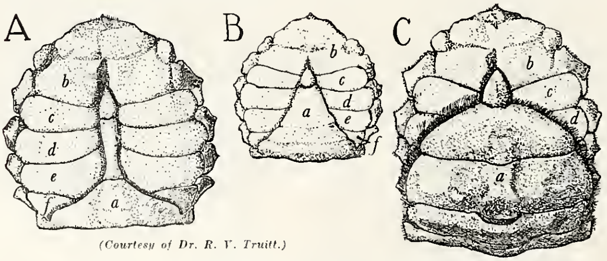
THE NET PREFERRED

But the string method of crab fishing never did appeal to me. No professional will even dream of using it. The crabs seem to take an especially great delight in nipping the strings and running away with the bait. Nets are better; cheaper in the long run. Besides you could use nets off heights, like bridges or high wharves, whereas strings are good only off the shore or some very low place. A crab will never hang on long while traveling through thin air. About the best place for the string method is off the sides of a skiff, where you could shift around if they do not bite.

Here too do not ape the professional, who makes his living the way you play and to whom practice has given all the sleights and tricks of the game. Get yourself a dozen or so of those amateurish two wire-loop nets (thin wire), with a larger wire three or four inches above the other. Tie a piece of stout string (nothing thin; it won't last three crabs) across the top wire-loop for a bait line. Never tie your bait direct to your net. The crab will tear all your webbing to get at his dinner. Be fast when you lift. Don't give the crab a chance. Use the old gambler's adage: "Never give a sucker an even break." No crab'll ever give you one. So lift swiftly and steadily; don't jerk. Use a strong #60 twine for your lift line, with not too much slack. The moment Mr. Crab feels the least movement of your net he's off; no bait will hold him or make him linger. You oughtn't find it hard to get hold of these sportsmen's nets. Decatur Street, around the French Market, is full of them.

Don't mess around with those big thick wire (single loop), shallow nets the professional fishermen use. These are made for them, not for you. What would you think if your wife bought a ten gallon restaurant stew-pot to cook the dinner in? It takes training to use such nets. You'll be more in the water than out of it. Take it from me, who knows.

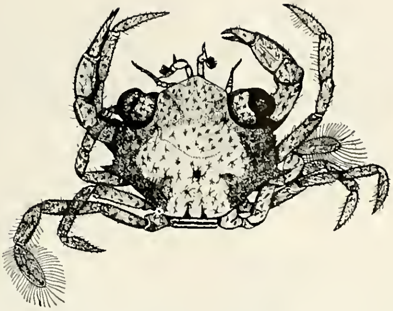
And if you should feel like knitting your own webbing, that's O. K. with me



(*Courtesy of Dr. R. V. Truitt.*)

IS THE CRAB A LADY OR A GENTLEMAN?

■ **Here are shown ventral views of: A. A male crab; B. An immature female; C. A female. The lettering indicates: a. Abdomen; b. to f. Segments of the plastron or hard "under shell" of the crab.**



(Courtesy of Dr. R. V. Truitt.)

THE CRAB GROWS OLDER

First stage of post-larval Blue Crab.

too. Use hard-laid #9 twine. It doesn't tangle as quickly as soft laid does and the crabs can't get such good claw holds on it. Make your meshes about one inch square. Give the small crabs a chance to grow. Don't make your nets too deep. Crabs tangle up in deep, loose webbing like kittens in balls of yarn. And they're hard to get out—hard especially on your fingers. For they have a mean way about them when once they find themselves enmeshed in soft laid #9. So be wise and careful too.

Hard crabs like shell reefs. If you know an oyster bed somewhere keep it to yourself. It's a prize. Rent a skiff; drop your baited nets over the reef, or use lines, as you will. Mouths of bayous are also good, especially at outgoing tides. The water gets shallow in the marettas and lagoons and the crabs (fish too) seek the deeper water of the bayous and big ponds. Scatter your nets around the entrance of the bayou, but be careful not to put them directly in the current. Not far from the shore, on both sides of the bayou's mouth will do fine. All traveling crabs usually stop for a bite as they go along on their journey. So pull up steadily on your net. Be quick but don't jerk. A steady even strain does the trick. Once the water pressure holds your crab to the net he is indeed your crab. With lines, of course, you'll have to take it slower and easier. That way it's more of a matter of coaxing than of dragging along. And don't forget to be fast with your scoop.

WHAT TO THROW BACK

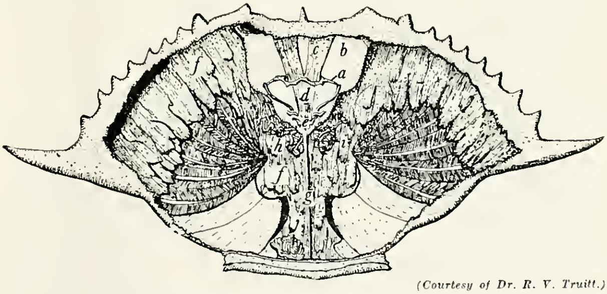
Throw back all those light, clear crabs. They aren't any good—skeletons, hollow, skinny, freshly shed. Let them feast awhile and fatten up. You may catch them some other trip—maybe. And those big crusty-looking grandpas, often with barnacles on their backs. I used to catch lots of them down the Gulf. They're fine, providing you can boil them almost then and there. But the trouble is that they just don't care to live out of water long enough. They'll die in your basket on the way home. Throw them back. However, if you don't believe me, then take them home—and throw them away. And be a real "sport", please. Give all those little fellows another chance. We, who make our living at it, do so. They're so small. But they'll grow—and breed. So back with 'em and be a "sport". Don't be greedy. Let's fish for crabs in these waters ten years, fifteeen years from now too.

Don't jumble your crabs in your basket (use a basket or shallow hamper, not a sack). Never lay a crab on his back. You sign his death-warrant when you do so. Don't throw him. He's got sharp points that will stick some other crab. Lay him down gently. That way he won't fight and there'll be no arms and legs and claws and paws in the bottom of your basket when you dump it out at home. Put a layer of wet moss or grass on the bottom of your basket; then some crabs; then more wet grass; and so on. It's the best way, though it does take more time than otherwise. Sprinkle your catch before you put it in the car, ready and homeward bound. It helps. Crabs are aqueous creatures, with gills, like fish. But don't give them a deluge. Keep your basket out of the sun. Those vitamins that the ads tell us about are all right in sun-ray lamps and breakfast foods but crabs have, for eons and eons, done fairly well and prospered and multiplied without them. So put your basket in the shade.

THE TROT-LINE METHOD

Another good way of fishing hard crabs is the trot-line or palanga method. It's the nearest you'll ever come to being pro. Get some long poles. Next get some quarter inch rope, tarred rope preferably. Then some #20, soft or medium; not hard this time. Cut this latter into two or two and a half foot lengths. Make about fifty or more such pieces. Find a good spot over shell or oyster reefs or at the mouth of some bayou, where the lake bottom is soft. Stick your poles into the mud about twenty five to fifty feet apart, depending on how long a line you want to use. Weight your line lightly with sinkers, if there is a current, otherwise it will rise, and the crabs are mostly bottom-feeders (like catfish; an offhand bit of information). Bait your twine and tie it to your rope, each piece about five feet from the other. Let it all sink to the bottom. Wait. Smoke a cigarette.

O. K. You've waited. So now take your skiff and pull yourself gently along your palanga, using your short-handed scoop net as you go. But take it easy. Don't get excited. And don't pull Mr. Crab out of the water. He'll let go. It's



(Courtesy of Dr. R. V. Truitt.)

SOME CRAB INTERNAL ARCHITECTURE

■ Parts of a crab's "insides." Here the "back shell" of the crab is removed so that the spectator views it in reverse position from a person eating crabs. The "back shell" (carapace), the heart and the reproductive organs were removed before this drawing was made. a. Pterocardiac ossicle; b. Cardiac pouch of stomach; c. Anterior gastric muscle; d. Middle gastric muscle; e. Pyloric ossicle; f. Liver; g. Intestine; h. Liver duct; i. Pyloric caecum; j. Intestinal caecum.

great fun, all right—if you don't have to do it for a living.

And don't forget to dry your lines when you get home. That's the way they'll keep.

If the crabs don't bite, leave. Don't wait for them. It's a safer bet that you'll do better some other place, farther away. So try another spot.

Some "experts" say that tides have a lot to do with it. Some say tides don't. Take your choice. Me—I say nothing. I've caught 'em at incoming tide and at outgoing tide. And I didn't catch 'em at either incoming or outgoing tide.

Then, if you're pretty fast and good at holding your foothold, try a long-handed scoop (say about eight feet of handle) and go snooping around bridge pilings and logs. Crabs like to hang out on to these. You may even catch a soft one. The railroad bridge out at Irish Bayou (eighteen miles from New Orleans) is a good spot.

And if you should ever grow tired of fishing redfish and trout and not catching any; if you've lost bait after bait with hardly a tug or a jerk at your line—well, then, just forget the fish. Draw your sinker close down to your hook. Stick on a small croaker. Set your scoop close to hand. Go after crabs. They're there.

THE SOFT CRAB TECHNIQUE

Soft crabs are another story. Some old timers consider it a profession. Others swear it's an art. I call it lots of hard work. And I'll tell you this much about it in advance: "You'll never "make" enough soft crabs for a good-sized sandwich by merely coming down to the lakeshore a-Sundays and monkeying around. To "make" crabs requires several days. Ninety-five percent of all soft crabs are caught hard ("green" or "busters", as we say). They are put into boxes in the water, tended, nursed, fed, cussed at, and then taken out soft. You could depend on one-third of your catch dying in the boxes. And besides it takes time to "learn" the crabs. An entire season will hardly do. Take it from me. I've been there.

And here is their story: Crabs shed their shells just as snakes shed their skins. It's their only way to grow. Their skeletons are on the outside. A soft, velvety skin forms (oftener per year as the crab is smaller) underneath the hard shell. This hard shell eventually parts and then falls off. A soft, wrinkled, puffy crab emerges, slowly working its way out. A few hours later (according to the warmth of the water, the wrinkles are gone. The crab has "stretched"; it has grown. A small crab will grow twice its original size; larger ones grow in proportion. The bigger they are the less bigger they'll get. And the bigger they are, the longer it takes them to shed.

For this shedding—growing—process takes a bit of time. In boxes it takes much longer than it does in the open water. I guess a crab must feel it coming on. Too, he knows (as far as a crab can "know") that he is helpless during this stage of his life. Fish like soft crabs as well as you do. Even their fellow crabs consider them fair prey during this time. So our crab does the only thing left for him to do. He hides.

RETREAT OF THE SOFT SHELL

Along the southern shores of Lake Borgne is miles of soft, viney sea grass. It's the ideal place for a crab to pass his helpless shedding stage. He enters this morass as a "green" crab, several days before he sheds; he stays there as a puffy, pinkish "buster"; as a "cracked" crab, already open, he is still there; he is a soft crab there, safe in the thick sea grass; then a "paper-shell". And it is only after this final stage, as a hard "clear" crab, that he dares venture out into the open, confident in his ability to cope with his watery world.

But I must tell you in advance, before you even think of starting to "make" soft crabs as a vacation sport, that this is one angle of crabbing that is no place for the amateur or the "sport". To "make" crabs takes time, patience, experience, equipment, lots of hard work, a special appetite for soggy luncheon meat sandwiches and a special array of cuss words. Better leave all these to the pro. Paying for them with your hard-earned cash is safer, easier and cheaper. Besides you'll have no blisters on your hands.

And yet here are a few words as to how the pro's do it. We take a small but deep and heavily leaded seine with fairly large meshes, a bag in the center and a pole at each end. Each man takes one of the said poles and stretches out the seine, into a sort of shallow half-moon. Then each man turns into a mule. We drag and we drag, barefooted, and we never stop for mud or grass or clam shells. We do this when the sun is still below the morning horizon, and it's way past noon when one of us pants: "Let's go home."

So we pack our seine on our skiff and go in. Once in, we start to work. We have our "greens" in one box and our "busters" in the well of our skiff. That's our day's catch. Once home, we take our "busters" and put them into our "buster" boxes, gently, for they are tender fellows and bruise easly, and die. We overhaul all our other "green" boxes, those of yesterday and the day before and the day before that. We take out those "greens" who, since the last overhauling, have turned into "busters". We look into our other "buster" boxes and remove all crabs that have shed and become soft crabs while we were fishing on the lakeshore with our seine. Soft crabs become hard quickly, especially in warm weather, and are very liable to injure those soft ones which mature later. It's around four P. M. now, maybe later. At eleven P. M. we'll have to look into our "buster" boxes again for more soft ones; at two in the morning ditto; and at two-thirty we set out to fish.

Now go ahead if you care to try it. Make soft crabs.

Sorting crabs, or as the local argot has it "telling" them, is almost a sort of sixth sense, once you get used to it. It takes time, however, and patience. Some never learn it. Color, touch, weight, all have something to do with it. You can't make too many mistakes. A voracious hard crab or "green" thrown accidentally into a "buster" box can raise hell with the helpless shedding or soft ones, and incidentally with your slender pocketbook. But then, as I've remarked at the start: every man to his trade. Maybe you've watched some sun-scorched, bewhiskered crab fisherman sorting his boxes. He seems hardly to notice his crabs, throwing them here or there, two to the second, jabbering away at his companions all the while. Now and then, in doubt, he'll pause a brief second or two, pinch off a joint of a leg or squeeze a flapper to see how far the soft skin underneath the shell has advanced, then zip!, a twist of the pinchers, and he's off again. Then he may doubt a crab; it may shed soon and then again it may not. It may raise hell among the "busters". So off comes a nipper off each claw, and the doubtful one finds its way into a "buster" box. It's all in the technique, folks; all in the technique.

Some fishermen use "tapaderos" or covers. The seine (it's about one hundred feet long) is stretched loosely across the mouth of some bayou when the tide is coming in. Crabs following the lakeshore drift in with this running water and cling (for crabs just love to cling) to the webbing. The fisherman goes along the seine, afoot or in his skiff, and picks off each crab with his short-handled scoop net. As a rule, though, these "tapadero" crabs are hard shedders and die easily in captivity. But all this is pro stuff to you, Mr. Amateur, my friend.

But don't worry. You still have a chance to compete a bit with us and have your little fun, even though it's about your only chance as far as soft crabs go. I refer to the long-handled scoop net, with the metal rim flattened out in front, so that it almost resembles

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The Sex-Life of the Bass

by
Henry E. Belden

The oft-repeated tale of the young neophyte who remarked "poor fish" on being told about the reproductive processes of the piscatorial genus, is badly misleading. As a matter of fact, all fish have a definite sex life, which varies in interest to the observer, and we suppose, to the individual fish, (Sunfishes and Black Basses) according to the particular variety involved. The family *Centrarchidae* offers an interesting study in home building, courtship and family relations. There are some thirty-eight species of this family in North America, of which the Largemouth Black Bass is the head, due to his popularity among anglers and his widespread distribution.

In the spring when the temperature of the water begins to rise, the Black Bass becomes restless, like man, and begins to think of building a home. He cruises about his lake or stream until he has found a likely spot in some secluded bay with water about two to six feet deep. He prefers the bottom covered with fine pebbles and will stand in a vertical position and with powerful strokes of his tail, sweep out any accumulated silt or slime which may cover the pebbles. This love nest must be perfect. If some of the pebbles should be of uneven size or too large, he will roll them out with his nose and has even been known to carry them out of the nest in his mouth.

The lady of his adoration does not take part in these operations—in fact she has not yet been selected. His activities will attract the attention of eligible maidens and at times a coterie of interested hopefuls surrounds the nest.

When our young stalwart has completed his work, he will have hollowed out a space twice his length and usually ranging from two to three feet in diameter. He continues his "fanning" operation, keeping the bottom free from sediment and, in sluggish waters, improving the circulation. From time to time he circles the nest and makes little sorties in search of enemies.

When all is in readiness he will set out to find a mate, but will not have to look far as the curiosity of the fair sex is apt to have been aroused. On selecting his mate, he will drive her into his nest. It has been observed that while the female does offer some resistance, the resistance grows weaker with each attempt. Finally the pair will be seen swimming slowly in circles around the nest, the male always on the outside, as though fearful lest his beloved desert him for another. As they circle thus ever close to the bottom of the nest, our Lochinvar bestows his caress in the form of firm though gentle bites on the corner of the mouth, the cheeks and the gill covers. Scientists claim that this stimulates the egg-laying process.

(Editorial Note: Henry E. Belden, born and raised in New Orleans, has gained for himself national fame as a top flight sport fisherman of salt and fresh water. Few can match his knowledge of the chase of the finny tribe and few can predict as well as he the unpredictable fish.

Mr. Belden, who now lives in Los Angeles, published the following discussion of the Black Bass' home life for the PASADENA JUNIOR LEAGUE NEWS. The Largemouth Black Bass, always known in Louisiana as the "Green Trout," is one of North America's most superb game fish.

That the courtship is conducted with evident emotional stress upon the individual is indicated by the color changes which take place, apparently a phenomenon closely akin to the flushed cheeks and quickened breathing of lovers. At the time the male fish drives the female over the nest, both have their normal green colorations. Soon the female takes on a rich brown tone, her belly becomes silvery and stands out in strong contrast, and a white spot shows up on the tip of her gill cover. The male too takes on a deep brown color. The actual spawning is intermittent and lasts for two or three seconds at a time. They lie side by side, their tails being horizontal or at an angle of forty-five degrees. Now and then the female rubs against the pebbles lining the nest, turning from side to side to scrape off any eggs.

The female remains in the nest for two or three hours. When she leaves, the male is doubtless overcome with feelings similar to those which arise in the hearts of Junior League husbands whose wives absent themselves from home for play rehearsals and committee meetings, for he pursues her for a short distance and attempts to drive her back into the nest. Paternal duty proves the stronger urge, however, and he returns to the nest. By this time the eggs will have adhered to the pebbles and we find our expectant father alternately fanning the eggs with his tail and swimming in circles around the nest.

If a likely female comes by, she will be received with the same vicious strike, but by feigning to mistake this for playfulness, she may arouse our hero's interest. In which event, she too will be invited into the nest, and the performance just described will be repeated. This may occur several times before sufficient eggs have been accumulated to satisfy the paternal instincts of the father. When we consider that by actual count as many as ten thousand fry have been counted in a single nest, we should not be too harsh with the male for his lack of fidelity to his first love.

The family cares of the mother are over from the moment she leaves the nest. For her, the divorce is final and complete. Not so for Papa Bass. He continues his fanning operation until the eggs hatch, which is usually in from three to ten days, depending on the geographical location and the temperature of the water. He then finds before him a compact mass of tiny progeny, which he herds together and guards faithfully for about a week, taking no food and fearlessly attacking intruders. At the end of his time there comes a sudden change in his attitude. Gone is his former paternal devotion. He is tired and hungry. This business of being a nursemaid is becoming quite a bore. His patience snaps and, circling back from his group of children, he makes a savage strike into the undulating mass, mouth open and gulping, and devours hundreds of the small fry.

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(*Photograph by A. M. Bailey.*)

■ The Louisiana Cardinal, one of the most familiar and attractive of our native birds, is here shown at its nest.

GUARD WELL OUR FISH AND GAME

By

James Nelson Gowanloch*

(Photograph by James Nelson Gowanloch.)

■ **Black Skimmers sweep past above the coastal waters of the Gulf of Mexico. Louisiana's superb climate and terrain afford the habitat for one of North America's richest avifaunas.**

Fish and game are among Louisiana's rich natural resources that are both expendable and self-replacing. Their basis is in biology. Their proper utilization depends upon biological information. But the complex environment in which these resources must perish or survive includes complicated factors which while themselves not necessarily biological, have biological effects and correspondingly aid or damage the species of mammal, bird or fish concerned.

Recently the author, together with Senator Ernest S. Clements, had the privilege and pleasure of addressing the Southwest Fish and Game Association at Lake Charles. This group was having its third meeting on that occasion. Eight people attended the first meeting, 160 the third meeting. Fish and game associations are extremely important and this is one of the reasons for the present discussion.

Fish and game are assets of value not only in the joy of life, but also in the hard matter of dollars and cents. The writer has fished and hunted in many of the states of the Union and many of the Canadian Provinces. It does require comparisons with elsewhere for us to realize how rich and valuable is our Louisiana heritage.

Here, as everywhere, game protection needs local leadership. One man with courage and force to back up his principles is worth a thousand men who agree with those principles but do nothing about it. The Southwest Fish and Game Association is one of a number of such excellent associations in Louisiana. Some other states have far out-stripped Louisiana in the formation of such useful groups. The capacity of such associations for good work is incalculable. No other influence can fully take their place.

Louisiana stands at a conservation crossroads. Industrialization of Louisiana is proceeding, with the damage to wildlife that industrialization may bring, but need not necessarily bring, as an inevitable train. The writer has been concerned with the investigation of plenty of such trouble shooting matters in Louisiana during the last nine years. What follows is simply set down for the purpose of indicating some things we must do if we are to preserve the wildlife of our State.

Quail and fish do not belong to you or to me, they belong to our children and to our children's children. It is only necessary to go to some of the highly industrialized New England States to discover the damage industrialization and its concomitant pollution has wrought. It has meant, for example, complete extermination in many areas of that fine salt-water fish, the Sheepshead.

Industrial concerns have carefully chosen officials who are efficient, and efficient they must be since industry gives them their bread and butter and provides the bread and butter for often tens of thousands of people on their payrolls. But, on the other hand, if a new industry enters a community, too frequently, anything that kills fish from a stroke of lightning to a hundred year drouth is without hesitation blamed on that industry by people who do not take the trouble to seek out and consider facts.

Pollution, One of Wildlife's Worst Enemies

Pollution is one of the worst enemies of Louisiana wildlife.

It so happens that by the grace of God and by grace of our peculiar water geography we have so far escaped to a great degree the damage and decline that has occurred in wildlife elsewhere. It is amazing to compare our own marvelous wildlife resources with the resources of certain northern states that derive vast annual incomes from hunting and fishing licenses and yet so many of the people of those states purchasing those licenses get practically nothing in return. Game and fish are gone.

It is my belief that the formation of local hunting and fishing associations will aid immensely in preserving Louisiana wildlife.

We have, in Louisiana, huge wildlife sanctuaries which not only do us particular local good but are nationally invaluable because they serve to harbor during the winter season a good proportion of the wildlife and other wildlife not only of the United States but also of Canada. These resources we must regard as national and international assets of highest importance.

Pollution is an extremely flexible term since obviously even the first Indian camps and deer dressing grounds contributed pollution to adjacent streams. For present purposes pollution may be regarded as essentially those changes in environment, air, land or water, which bring about damage to man or to useful natural resources.

Industrial pollution is especially complex since industry seeks certain marketable products, such as, for example, various forms of cellulose in the wood pulp industry, or fuel oil and its marketable derivatives in the oil industry. These materials may occur in association with a vast variety of other substances which, being valueless to industry, are discarded. Often among these waste products occur substances that have powerful, dangerous, even fatal, effects upon living organisms, especially upon aquatic organisms, such as, fish, oysters, clams, crabs or shrimp. The entrance of such substances into fresh water streams may differ in effect from their entrance into ocean waters. Sea water, so complex in its own structure and so well "buffered", may render harmless a pollutant whose effects in fresh water would be fatal.

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* Chief Biologist, Louisiana Department of Conservation.

Living material itself is composed of an almost inexpressibly complicated material termed protoplasm. Painstaking and prolonged research by brilliant biological chemists has completely failed to synthesize artificially the substance of life. Life cannot be created by man from non-living materials.

The "Tripod" of Life

All life, from man down to the lowest organisms, such as the microscopic amoeba, may be said, for practical purposes, to rest upon an essential tripod of respiration, innervation and circulation. Foods are necessary to support life, but, in the functional failure of any of the three basic processes indicated, the organism dies, quite independently of how abundant food may be. Pollution may strike at any one, two or all three of these fundamental processes. Thus, for example, certain products from crude oil which dissolves in sea water may paralyze the feeding mechanism of oysters to a fatal degree, although these substances are present in such minute quantities that their chemical detection and qualitative analysis is still impossible by any practical means. The interference here has been shown by careful physiological research to affect the innervation of the oyster. These minute concentrations of the pollutant cause a paralysis of the nervous transmission of the oyster so that the feeding mechanism fails as soon as they are present in even minute quantities.

Respiration is a function of the living protoplasm which, with rarest exceptions, can be suspended only temporarily without fatal results.

Circulation involves the distribution within the organism of the necessary food materials and of oxygen which is itself a food so that the various tissues and organisms may be maintained in activity.

It must be understood that this description presents a simple, generalized, practical picture of what goes on in living animals. It must also be clearly understood that these functions do not stand alone, but are so inter-related that the impairment of one may cause the complete collapse of the animal.

The direct effects themselves may be highly variable. Respiration may be blocked in many ways. Thus, for example, a substance entering the water may use up so completely the oxygen present that none remains available for the organism. Again, the poisonous substance may paralyze the breathing apparatus of the fish and thus asphyxiate it. Again, still other poisons may block the actual use of the oxygen by the cells composing the fish so that, despite abundant oxygen in the water surrounding the animal, and despite abundant oxygen being transported by the fish's blood stream, still that fish dies from oxygen hunger.

Toxic substances may also have differential effects upon various growth stages of the organisms concerned. Adults in some cases may survive while the young perish, whereas in other instances the young may survive while the adults perish. Sometimes the indirect effect of pollution may gravely impair or

(Photograph by James Nelson Gowanloch.)

■ Louisiana affords the summer home and breeding grounds for vast numbers of beautiful birds. Here is the heart of a bird colony on one of the Chandeleur Sound islands. Cabot and Royal Terns are here shown with in the foreground a Laughing Gull. The teepee-like object in the center is the photographic blind of another bird photographer.

(Photograph by A. M. Bailey and F. R. Dickinson.)

■ Wild Mallards ("French Ducks" they are called in Louisiana) and a few other species of waterfowl cavort on one of the ponds of the Rainey Wildlife Sanctuary in Louisiana. These are just a few of the millions of ducks that find their winter home in Louisiana. It was carefully estimated by best available scientific methods that on a single Louisiana lake, (Catahoula Lake near Alexandria) three million wild ducks wintered, probably one of the richest waterfowl centers of the entire continent.

entirely wipe out the reproductive success of a species. Changes in composition of the water may produce flocculent sediments which cover the eggs of fishes laid in lake or stream bottom, cut off oxygen and prevent development.

It should be pointed out that in some alleged pulp mill pollution cases fishes are found whose gills are jammed up with waste fiber. The conclusion is mistakenly arrived at that these fishes have for this reason suffocated. A proper biological interpretation gives quite another picture. A normal fish has a highly efficient apparatus for the discharge of such fibrous material. It is only when the fish has become abnormal or maribund, through other causes, that these fibers block the gills.

Concentrations, even extremely low concentrations, of certain pollutants affect fish indirectly by destroying the food upon which they live. When these "food chains" are wiped out fish migrate or starve. Another indirect effect noted in certain of our experiments was that gars, turtles and water snakes, all three serious enemies of game and food fishes, may, because of their air-breathing capacities, survive in a pollutant concentration fatal to game and commercial fish. Fish, impaired in activity, fall easy prey to enemies. It is in the face of attacks of such enemies that any returning migration of game and commercial fish, into an area recovered from pollution, must be made.

Responses to Pollution Vary with Species

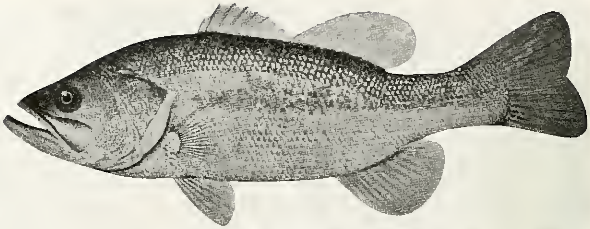
The highest variability exists among various fish species in their sensitivity to the action of various pollutants. Thus the work of Belding shows that in the case of hydrogen sulphide, a common industrial pollutant, 86 parts in ten million destroyed brook trout in a period of one hour, while 38 parts in ten million sufficed to kill common suckers (*Catostoma commersoni*) in the same time; 43 parts in ten million for goldfish, while one part in one hundred million killed water fleas (*Cladocera*), an important and often essential element in the fish food chain. Any pollution problem therefore requires careful and critical analysis in terms of the toxic sensitivity to these elements which, directly or indirectly, influence species of importance to man.

A further important aspect of the whole picture of pollution of natural waters is that frequently industry strives to secure certain more or less homogenous products. Thus for example, the pulp industry seeks cellulose in its various grades of purity. The oil industry seeks crude oil and its marketable derivitives. The waste products in such instances are of extraordinary and varying complexity, containing not only a wide variety of substances, some toxic and some innocuous, but also an incredibly wide range in the concentrations of these various chemicals. The solution of the essential problems of pollution, therefore, lies in three directions: First, the manufacture from present waste products of marketable by-products; second, the destruction by chemical or other means of the toxic action of waste products; and, third, the temporary storage of such harmful waste products until such times as their disposal into streams at various heights of flood stage will bring about a dilution sufficient to prevent damage to fish or other valuable aquatic resources.

Pollution presents problems not one of which is without a solution. The Department of Conservation has set up a laboratory of industrial research, under the direction of Mr. W. F. Chisholm, that has done, in spite of handicaps and financial limitations, work of primary and permanent importance. It was the pleasure of the writer to be associated with Mr. Charles Davis, Chemical Engineer of that laboratory, in the investigation of a paper mill pollution problem. The industrial plant concerned was providing the livelihood of thousands of individuals. Annual production was in excess of two million dollars. It was obviously both stupid and impossible to close this plant down. This particular mill released between thirteen and fourteen million gallons of combined waste water daily, representative of the unrecoverable chemicals and accumulated impurities of the kraft pulp and paper industry. Essentially, these waste waters contained inert material used as fillers in the manufacture of paper and a dilute solution of ligneous compounds not recoverable in the reclamation process which is the essential part of this industry. The waste water as it is released from the mill is not capable of supporting acquatic biota. However, on dilution with river water of the stream into which it is discharged its lethal effect becomes less pronounced as the proportion of river water increases until such a point that no harm results. The writer supervised biological experiments investigating the resulting biological effects of this waste under natural conditions of corresponding dilutions of river water resulting from fluctuations of river flow to mill waste discharge.

The biological experiments consisted in part of using large mouth black bass, "green trout," in carefully constructed live cars placed over an extent of twenty-five miles of this river under carefully and scientifically controlled methods. Results were amazingly well defined and established two zones unfit for higher aquatic life. In the first zone, which was within the first five miles of the mill discharge, mortality of fish life apparently resulted from toxic effects of some component of this waste. Inasmuch as mortality did not result in the zone immediately following, this indicates that the cause or effect resulting in the first zone was rapidly dissipated. The second zone of unsuitable water resulted from the depletion of oxygen contained in the river water through oxidation and biological decomposition of the ligneous waste material. In this instance death resulted from suffocation. Investigation further down stream disclosed that when this waste water passed through these stages referred to above that no other harmful effects resulted.

By comparison of the extent of the zones of contaminated water with the corresponding dillution ratios, it was found that these zones were fairly well defined and fluctuated with the change of dilution of waste to river flow. Two other factors of importance noted were temperature and the condition of the river water upstream. The resulting conclusion of these experiments, was that a method of control could be set up where by the extent of pollution could be controlled by varying the mill discharge to meet the stream conditions prevailing.


■ **The Largemouth Black Bass, the "Green Trout" of Louisiana, is one of North America's finest game fish.**

To eliminate pollution entirely will entail a program of abatement, whereby these restricted zones of pollution will be gradually reduced year by year through scientific research within the mill. It is necessary to state again that naturally officials of such enterprizes are interested not in the sports fishing, nor the commercial fishing, but in the welfare, the prosperity and the dividends of their own companies, for that they cannot justly be criticized. They are constantly irritated by unjust charges against them for pollution for which they may have absolutely no responsibility.

Gars Must Be Destroyed

Gars are another matter that fish and game leagues should regard with deepest concern. The writer in an earlier issue of this publication (Autumn 1939) has set forth some of the earlier results of these investigations.

Gar rodeos with their usually accompanying barbecues are entertaining social affairs but as far as gar control is concerned they are almost negligible in conservation effect. Gars must be systematically destroyed. All four North American species occur in Louisiana. Gars are extremely prolific. The writer by scientific methods estimated the number of eggs in a single six-foot gar, and the result was the astounding total of 944,000.

It happens that a gar trap of extraordinary efficiency has been invented and patented by Bert Oldham, a commercial fisherman of Louisiana. It was the writer's task to examine scientifically the possible usefulness of this device as a means of gar control. These experiments, carried out with the greatest care, covered a period of eighteen months. The results were astonishing. Experiments at first were conducted using a commercial hoop net four and a half feet in diameter and nine feet in length with a gar-trap-game-fish-escape placed at the back of the first chamber, the second chamber being closed. This second chamber was necessary so that not only could the gars be caught but the game and commercial fish, which would ordinarily escape, could also be noted, recorded and released. Thus the effective gar trap of these experiments measured only four and a half feet by nine feet. The results were most satisfactory. One area in which the writer had fished many times without catching a single game fish was trapped out in a period of only a few days. Two hundred and ninety-five pounds of gar were taken. One year later sportsmen in only a period of three or four weeks caught legally from this area over three hundred pounds of Largemouth Black Bass, Perch and other game fish.

The writer had the pleasure, this year, of addressing, by invitation, the international conference on wildlife called by President Roosevelt in Washington during the month of March. This conference, at which he was one of some forty speakers, was attended by sixteen hundred delegates from three countries, the United States, Canada and Mexico. It was highly interesting to note the enthusiastic interest displayed by these scientists in this practical solution of the gar control problem. Since that time the writer has been conducting large scale operations in gar control. He has, for example, supervised one experiment in which almost six tons of gar were taken from Lake Providence in a period of less than two weeks, thus virtually eliminating, temporarily at least, the gar as a present predatory factor.

Gars attain a large size. Hundred pound Alligator gars are common, three hundred pound gars are not infrequent. Stomach examinations of all specimens were made and it was found, contrary to popular opinion that gars are scavengers, they are not so. They are alert, stealthy, efficient killers of living fish

■ **The Kentucky or Spotted Bass, quarry of many an eager fisherman, is a species of fine game qualities.**

and crabs and other useful aquatic life. The writer has been concerned with problems of fish biology for the last twenty-three years and has never yet met with a fish that digests its food as rapidly as does a gar. Gar control should be carefully considered by every fish and game association.

Gars are not only edible but quite palatable when properly prepared. The demand for them as food fish far exceeds the supply. Gars can be sold in Louisiana for two and a half cents a pound "as is." New Orleans markets will pay wholesale four and a half cents a pound for dressed gar flesh. Gars dress out about fifty per cent. Gars sell retail for twelve and a half cents a pound in New Orleans and provide excellent fish steaks, fish cakes and other fish dishes.

When you get rid of the gars the next thing is to get the game fish back. A re-stocking program should be energetically carried out using every means available, namely, State fish hatcheries, Federal fish hatcheries and particularly the use of seining crews working, under legal sanction, in barrow pits and other places not normally fished where there exist great numbers of highly prized game and food fish which would in the absence of their rescue almost invariably die due to the drying up of barrow pits and similar pools during hot weather. This work will transform a lake that has been a constant disappointment to the sports fishermen into a lake to which ardent fishermen will come for hundreds of miles around for a good day's sport.

"Green Trout" Close Season Urged

One more matter deserves special mention. It has been the opinion of the writer that we should establish a close season on one of the most important game fish of the North American continent, the "Green Trout." The "Green Trout" has peculiar habits. The male builds a nest of gravel usually a yard or less in diameter. He builds this by carrying in his mouth pebbles until a shallow basin is formed. The female therein deposits her eggs which in the absence of the male would perish because he guards them and fans them. In the absence of fanning silt will accumulate on the eggs and they will die from lack of oxygen. Unprotected the eggs would be defenseless against the myriad hungry mouths that exist under the water surface. The male Black Bass at this time is extremely ferocious. He will attack anything nearby and at this time he can be taken with almost any lure for he will strike at anything that approaches the nest. His death means the death of all the thousands and thousands of young for even after they are hatched the young school and are cared for by the male for the first week or more of their active life. The male convoys them and guards them against the innumerable chances of attack by minnows and other under water predatory forms. It is therefore the writer's opinion that we should establish a close season lasting probably from mid-March to mid-May. This, the writer discovers through consultation with various leading sportsmen, will, in their opinion, entail no real hardship for any sportsman since he can at that time fish for other fish. If at that time the Largemouth Black Bass should be taken he should immediately return it to the water in as unharmed a condition as possible.

Enforcement is another critical factor in saving our wildlife. Every time that a disappointed fisherman buys illegal game fish, and the writer knows of many such instances, he is fighting actively and effectively against conservation. If the fishless fisherman wants fish, there are plenty of fish that he can legally buy but the outlaw who uses the trammel net illegally or seines out and sells game fish is a potent enemy of good sportsmanship, deserving fullest condemnation. He is just as bad a citizen as the man who bootlegs wild ducks for the market.

Another effective factor is work through boy scouts, girl scouts or other organizations. The illegal shooting of birds is a bad business. The boy can readily be taught that it is bad sportsmanship to kill a mockingbird or other song bird with a sling shot. He can readily enough find less valuable marks to hit. Educational work of this sort is highly productive of good conservation results. Every kid likes to wear a button and if you give him a button and make him sign a pledge that he will not harm our song birds but will obey the game laws he will think twice next time before firing the stone that may mean the death of some beautiful and useful bird.

Louisiana stands at a conservation crossroads. More and more we are going to be industrialized. More and more imperative, correspondingly, becomes the need to gain the basic data necessary for the solution of pollution and other problems, and to use the organized wisdom and valuable power of the good sportsmen of the State. Local leadership is everything. Fishing clubs and hunting clube can mean a great deal. They must mean more than did the man who came into a sporting goods store in New Orleans and absent-mindedly sought to buy a fishing rod. Asked what kind of rod he wished he also absent-mindedly remarked: "Oh, something that will hold about two quarts."

Game and fishing clubs should be earnest centers of real conservation and they can be. Few factors can better aid in preserving for us our wildlife heritage that is beyond price. The writer cannot more earnestly plead that you turn your thoughts to these things and having turned your thoughts that you do something about it.

Quail, fish, doves and other wildlife do not belong to you, they do not belong to me. They belong to our children and to our children's children and to them we must convey, as undiminished as is possible, this just and rich inheritance.

QUEER FISH:

Some fish are unusual with respect to their body covering—not all have scales.

A South American catfish and the sea horse are armored with bony rings, and certain gars of North America are covered with hard, bony quadrate plates, with an outer sharp, cutting edge. The bat-fishes are completely covered with bony tubercles; the puffers are covered with prickles; the porcupine fish with long, sharp spines.

Most interesting and strangest body covering of all is found among the sharks. As if the five or more sets of teeth in the hammerhead's jaws were not enough, nature provided this shark with teeth (denticles) set in the skin of the entire body.

■ Irises of every color.

Spring-Time In Louisiana

by

Percy Viosca, Jr.

"Peep-peep-peep" from a woodland pool in a dripping rain comes the voice of the peeper, harbinger of spring; fields and meadows resound with staccato notes of the chorus frog in endlessly repeated crescendos; in a nearby pond the leopard frog laughs, chuckies and grunts in approval of the first warm shower.

Beneath the pines, the birdfoot violet takes advantage of the dead grass to take a peep at the early spring sunshine, while in swamp and slough, the seeding maple vies with the leafing willow to put a touch of brilliance in a somber gray landscape.

Soon budding oaks are tinting the vistas with golden green, enhancing the shadowy black and silver gray drapes of swaying moss. Against such a background, the panorama is varied with the scarlet and red of the maple, the snow white daintiness of the mayhaw, and the lavender splashes of the glorious redbud. Golden crowns of the ragwort against the bare black humus and the yellow jasmine clinging tightly to the bare trunks of sleeping trees give brilliance and contrast to the close-ups.

For true flower lovers, already there are dainty little bluets and butterworts; toadflax and violets, daisies and spiderworts; but for the rest of us the frosty blossoms of blackberry brambles are scattered about simply as a reminder of the approaching season for blackberry pie.

The hunter sighs as he oils his gun and lays it away; but he is cheerful again as he fondly caresses his creel and rod. Overnight highway and byway becomes alive with crawfish catchers, whose nets, baited with "la-rot", are set in ditch and swamp to entice the early crawfish before he has a chance to catch the early worm before the early bird. That roar from the swamp is not March coming in like a lion but the first bullfrog announcing that frog eggs and frog legs are coming into season.

That repulsive looking creature crawling on little Johnny's ear is the first tick of the season as time March-es on and the purple-gray background of the winter woodland becomes completely obliterated by a lavish display of golden and bronzen greens and reds and yellows. Thus, the oaks announce their coming into full leaf and blossom; while the red maples still doing their bit, are now assisted by a vast array of awakening foliage which bursts forth in almost every shade of red and yellow-green, giving contrast to the soft verdure of the pines. And, as if in celebration of Nature's resurrection, the kings of the forest are

■ Reds and glossy greens of the firecracker plants.

lavishly crowned in the red and gold of the wild bignonia; while the queens, with exquisite grace, are crowned and perfumed with lovely garlands of the delicate golden, yellow jasmine; her maids, adorned with lavender festoons of wild wistaria.

Meadows and roadsides are now brightened with undulating patches of the windflower primrose in pink and white, and the fleabane daisy in lavender and white. In the bogs, trumpets, orchids and butterworts put forth their daintiest display of waxy blossoms; while knee-deep in water, on the borders of chromatic pools, stand feathery white spider lilies and flags of every color gently waving in the zephyrs of spring.

Completing the panorama, already one of Nature's masterpieces, are the guardian angels of the greenwood; one, the flowering dogwood with its white outspread arms beckoning all be still, while the other, the snowdrop tree, lifts its dainty white arms to the heavens in suppliant prayer that the garden beneath be protected from the vandals of the forest. And in the stillness of that garden that is Louisiana at its best, amid the fragrance of the yellow jasmine and the fuzzy blossoms of the sugar tree, the close-ups are splashed lavishly with the reds and glossy greens of the allspice and firecracker plant and the delicate pink clusters of the honeysuckle azalea. And beneath their feet the carpet is strewn with white and blue violets, blue and white bluets, yellow and pink oxalis, spiderworts in baby blue and pink, lavender celestials, blue-eyed baby iris, and other spring flowers no end.

■ **Delicate pink clusters of the honeysuckle azalea.**

■ **Undulating patches of the windflower primrose.**

■ **The flowering dogwood with its white outspread arms.**

■ **Spring flowers no end.**

NO NEED TO WAIT WHEN FISH KEEPS DATE; NEVER LATE

Fish may not be able to tell time, but one variety—the grunions, a species of small smelt—sets a classic example of punctuality for residents of southern California, according to the Bureau of Fisheries.

These Pacific swimmers come out of the ocean every spring to lay their eggs in the wet sands of the California beaches. Without consultation of wrist watches or alarm clocks, they invariably come up 1 hour after high tide, within a few minutes, beginning the third day after the full moon in the months of May, June, July, and August.

They are so prompt, the Bureau reports, that local newspapers publish schedules for their appearance, and the beaches are lined with thousands of people watching them come out of the water, riding on the crest of each big breaker as it rolls in.

Louisiana's Bull-Frog Goes To Town!

A long time ago, Latona, so the myth goes, weary and worn, came upon a lovely stream where she hastened to quench her thirst. Some countrymen of Lycia who were gathering willows, jeered at her and refused to let her drink, even muddying the water with their feet. Lifting her hands to high heaven she exclaimed, "May they never quit that pool but pass their lives there!" And it came to pass accordingly.

The boorish Lycian countrymen, transmuted to frogs, have lived in the water ever since, sometimes wholly submerged, sometimes raising their heads above the water, and sometimes coming out on the bank, but soon leaping back into the water again. The myth pictures them raising their voices in "rails," croaking in the midst of water with harsh voices; and describes them as having bloated throats, mouths stretched by constant rails, necks shrunken, with head joined to the body; it tells of their vivid green backs and how they dwell in dark slimy pools. So it seems that the frogs of today do not differ very much from those of the old Greek and Roman days in appearance and habits.

LIFE HISTORY (GENERAL)

These amphibians, from the Greek meaning "both" and "life", begin their existence in the water, and their later development enables them to be at home on land, or in water.

The general form of the body, the shape of the head, the long hind legs adapted to jumping, and the webbed toes for swimming, are practically the same in all frogs. Some modifications occur, in order to fit feature to function or environment, as the discs on the end of the tree frogs' toes, and their power of changing color to harmonize with the surface upon which they are resting.

The adult frog has several peculiarities which set him apart from other vertebrates. At times he literally breathes through his skin, and it is done in this manner:

The lungs are hollow sacs that lie back of the stomach. The oxygen of the air passes both through the skin and the lungs into the blood of the frog, and the carbon dioxide is thrown off through the skin and the lungs, also. The frog is furnished with large blood vessels close to the skin, especially along the back. These blood vessels send many fine branches into the skin. This explains how frogs breathe through their skins.

When the frog remains under the water a long time, especially in winter, all the oxygen enters the blood through the skin. In fact, what air does enter the lungs is SWALLOWED into them instead of being breathed into them, and it has been proven that even with the lungs shut off, a frog can get enough oxygen to maintain life under certain conditions, among them being that the temperature is low and that the frog remains relatively quiet.

Editor's Note.—The extent of the Louisiana frog industry will no doubt surprise many of our readers. During the past year (1939) there was a production of 2,015,916 pounds, which represented the same number of frogs with an average weight of one pound each. At the current market price of $1.35 per dozen there was a return of $226,787.55 to those engaged in this industry.

Notwithstanding the fact that there is a closed season on frogs in Louisiana, no catching and shipping being allowed in the months of April and May, there has been little if any decrease in production, and the fear has been voiced that there may be a diminishing supply of this delicacy for which Louisiana enjoys the distinction of being Purveyor No. 1.

The mouth of the frog is large, and short lips cover the short teeth in the edge of the upper jaw. The tongue is curiously formed, having two fleshy horns at the back end, and is attached at the front end to the floor of the mouth. The frog can throw its sticky tongue over the tip of the lower jaw, and use the forked end to catch insects which are then carried to the back of the mouth. Two groups of little curved teeth on the roof of the mouth aid in preventing the escape of the prey.

The food is swallowed whole, for the mouth is large, and the tube connecting it with the stomach can be stretched, so that a comparatively large animal can be swallowed.

REPRODUCTION

The fundamental process of reproduction in the frog family is the same as in all other animals, but there is introduced the tadpole stage which makes the reproduction of the amphibians different from that of any other vertebrates.

The male frog has a pair of spermaries, one attached to the front end of each kidney. Each spermary is yellow, and the sperms escape through the kidneys. In the female the eggs are in the ovary, and break through their walls and enter the oviducts. As the eggs pass down through the oviduct, they are coated with a jelly-like substance, that swells in the water and protects the eggs. At the anterior end of each kidney in both sexes is an irregular mass, the fat body, in which is stored the energy that the frog uses as it begins to grow eggs or sperms in the early spring, before there is plenty of food.

CLASSIFICATION

Frogs in general belong to a class of vertebrate animals called *Batrachia;* this group, including frogs, toads, salamanders, and newts, is of particular interest, because it marks the transition from aquatic to terrestrial life in the group of vertebrates. All the true frogs of America belong to the genus *Rana*, of the family of *Ranidae*, the most specialized of all the *Salientia*.

The *Ranidae* family is quite an old one, even as old families go in Louisiana. It is quite possible that they settled in the State as soon as it was at all habitable after land appeared above the surface of the shallow waters of the Gulf of Mexico.

EDIBLE FROGS IN LOUISIANA

The edible species of frogs of the State fall into two grops: (a) Those with more or less uniform dorsal coloration and with an ear drum larger than the eye in the male; namely, the green frog

(Rana clamitans), the bullfrog *(Rana catesbiana)*, and the Southern bullfrog *(Rana grylio)*. (b) Those which are spotted on the back, with the ear of the male not larger than the eye, namely, the southern leopard frog *(Rana spenocephala)*, and the pickerel frog *(Rana palustris)*.

The above forms are all true frogs *(Rana)* which have teeth on the upper jaw, no adhesive, enlarged discs on the ends of the fingers and toes and no large parotid gland back of each eye. Most of them are smooth of skin, and all reach an adult length of at least 3 inches, not counting the hind legs.

Quite numerous in Louisiana is *Rana clamitans*, the green or spring frog: and *Rana spenocephala*, the spotted or southern leopard frog. This can be recognized by the many brownish or green spots edged with white, which help this frog to escape his enemies as he squats among the various water plants. These colors form quite definite bands on the hind legs, though the spotting varies somewhat in individuals.

These last two varieties are never used for food in Louisiana, being small, rarely over three and one-half inches long. From an economic standpoint these species are beneficial, since their diet consists almost exclusively of insects.

DESCRIPTION

The common bullfrog, *(Rana catesbiana)* distributed over the entire State, is the largest of our frogs, and may reach a maximum length of nearly eight inches from head to end of body, exclusive of the hind legs. Its color is variable, running the gamut from yellowish green to very dark brownish green. The coloration varies from a uniform marking to, at times, a spotted blotched, or marbled pattern, the darker and lighter markings being sometimes in sharp contrast to each other. The throat of the females differ by being whitish, and the ears and thumbs are considerably smaller than those of the males. This species occurs throughout the entire State of Louisiana and may be seen along every shady pond, creek, river, bayou, and lake, but it is particularly abundant in the wooded alluvial lands or cypress swamps, for like all other amphibia frogs abhor salt water. Its deep bass voice is familiar to everyone and gives it its common name. The accepted belief is that the bullfrog has but one note—a deep bass bellow. But those who have lived close to frog ponds have heard him give voice to quite another sound. When he is seized by a powerful enemy such as a hawk or otter, he utters a shrill shriek distressing to hear. "It is a loud, prolonged, high pitched scream, containing anguish and antagonism, to such an extent that we cannot but think the cry is male by the human voice," says Mary E. Dickerson, an authority on frogs.

R. grylio, on the other hand, has a grunt resembling a hog, usually uttered in quick succession, in groups of eight grunts.

It is thought that individual frogs have the power to change their color, but the males usually assume the uniform yellow green markings, while the females seem to prefer the darker and brownish spotted shades. This is especially true in the breeding season, and may help to influence the mating. The males may be distinguished by their yellow throats, and by their larger ears and thumbs. The ears of the female are about the same size as the eye, but the ear of the male is much larger than the eye. The toes of the species are broadly webbed, and they are fine swimmers. The fore feet have four short weak toes. The under surface of the frog is greenish white.

R. grylio, the Southern bullfrog, apparently confined to the fresh water lakes and lagoons of the alluvial section, and hereabouts called the lake frog, was only positively identified as an inhabitant of Louisiana about twelve years ago. Writers on the subject confine its existence to the southeastern corner of the United States—Georgia, Florida and Alabama; but it was demonstrated recently that the *R. grylio* species was common in the

■ **Preparing Louisiana Bull-Frogs for Shipment to Market.**

State, and numerous specimens have been captured. *R. grylio* can easily be distinguished from his cousin *R. catesbiana*, by his vivid metallic, olive green head and shoulders, olive hinder parts, darker spotted, never marbled or reticulated. Sometimes four lighter, longitudinal bands are to be seen on the back of the young frogs. As in the other species, the male can be distinguished by the large ears and thumbs, and the yellow throat coloring.

The *R. grylio* is not as long as the *R. catesbiana*, the largest measuring not over 6 inches. Its head is narrower and more pointed, and the space between its eyes is narrower. Its feet are broadly webbed, clear to the toes, and indicate more aquatic emphasis.

The habitat of the two species is different, though their ranges overlap. The common bullfrog is averse to strong light, and prefers the shady zones, or becomes nocturnal. *R. grylio*, however, likes the open spaces, with plenty of light, and hence frequents the open ponds and lakes. He is confined to the alluvial section of Louisiana, where he frequents fresh water marshes, and is especially abundant in the many lakes and lagoons of these regions. His habitat may be described as being in the territory nearer the Gulf, in localities where fresh water is contiguous to salt tides.

R. grylio individuals are very shy, and are seldom seen by daylight, as they hide among the aquatic vegetation of the lake, and, when approached, quietly take to the water and hide in the mud—not diving with the loud SPLASH! of the common bullfrog. They are largely aquatic, and are rarely caught on the land.

Take any section of Louisiana, starting at the river, and it will be found that there is first a strip of cultivated ground along the stream, followed by swamp, then marsh, then open lakes or lagoons. *R. catesbiana* inhabits the first three sections where there is shade, and *R. grylio* the last two, the species overlapping in the marsh, where the rank vegetation affords shelter and shade for the one, and open ground and light for the other.

The common bullfrog occurs throughout the entire State of Louisiana and extends northward to Canada, and between the Atlantic and the Rockies. Its growth is slower and its size less as it extends northward, due to the longer period of hibernation and scarcity of food for greater periods of the year.

HIBERNATION

Bullfrogs, like other cold blooded animals, have a low internal body temperature. They can stand a water temperature near freezing for prolonged periods, and during cold weather sleep in the mud in the bottom of the swamps and ponds. From the first cold days of winter till the first warm days of February, they are rarely seen. Hibernation is governed entirely by temperature, however, and during prolonged periods of warm weather they may be observed occasionally in mid-winter, disappearing again as the weather turns cold.

BREEDING HABITS

Early spring is the season when the frogs emerge in large numbers from hibernating. They rarely start their bellowing until late March, and mating usually begins about the middle of April, and continues during May. When warm weather sets in they are particularly active at night, their avoidance of sunlight keeping them under cover during the day.

In April the large bullfrogs are ready to lay their eggs, but no matter how warm it is, their calls are seldom heard until after the first heavy spring rains, which may occur during the latter part of March, or early in April. The first male frogs to find a suitable breeding spot (usually a deep section of the swamp) begin to call, and within a few days a thousand or more may gather and sing in one deafening chorus.

Egg-laying begins immediately after the females, attracted by the call of the males, find the breeding place, and large masses of many thousands of eggs are laid by each. During the egg-laying time the male embraces the female, but the eggs are fertilized in the water, and are left to hatch by the heat of the sun. It is not improbable that eggs may be laid on successive occasions, as laying is controlled by wet weather and the condition of the swamp, and not by temperature; at any rate, egg-laying is extended over longer or shorter periods according to the conditions of moisture, though most of the eggs are laid in April. The egg-laying habits of *R. grylio* have not yet been observed, but it appears to take place at about the same time as that of *R. catesbiana*. However, the final transformation takes place in May when the tadpole is about a year old, as was the habit with the preceding species.

The eggs are surrounded by a jelly-like substance that holds them together. As the eggs are being laid by the female frog, the male frog spreads a large number of sperm cells over the whole mass. These sperm cells make their way through the soft jelly, and one of them must enter each egg, or else it will not be fertile.

As soon as the sperm cell enters the egg, it begins to change from a solid, pointed body into a round nucleus, which is so much like the nucleus already in the egg cell that none but experts in the study can tell which came from the sperm cell and which from the egg cell. These two nucleus come in contact and unite, leaving but one nucleus in the egg. This last change is fertilization, which stimulates the division of the embryo into formations of the various life systems and organs of the tadpole.

METAMORPHOSIS

As soon as the young tadpole hatches, which is in a few days, it attaches itself to plants, and lives for the first few days upon the food-yolk within its own body; the mouth forms, and horny jaws develop. Then the tadpole feeds upon minute plants, and becomes dependent upon its own skill to get food and escape its enemies.

For a time the tadpole breathes through its gills, two sets being used. The first ones are on the outside of the body, and last only two or three days, when the internal gills form in the throat and the tadpole breathes much like a fish.

Even as early in the Spring as March and April, it will be observed that many of the tadpoles have developed hind legs. At this time the tadpoles measure six or seven inches from mouth to end of tail. The tadpoles of the common bullfrog are especially fond of animal food, and they act as scavengers and dispose of dead fish, etc., and thus aid in keeping the water pure. They are also cannibalistic and when hungry may feed on each other.

In the growth of the tadpole into a frog the hind legs appear first. Later the front ones begin to grow, and as they develop the tail is gradually absorbed. While these external changes are going on, there are many complicated internal changes taking place; internal gills are-disappearing, and lungs, nerves, blood vessels, and muscles are being formed to give the new legs life and action. The internal lungs take the place of the gills in the throat before the legs are fully grown, and such tadpoles must rise to the surface to breathe air.

Different species take different times for their metamorphosis into frogs. The tadpoles of the leopard become small frogs in a single summer, while those of the bullfrog transform into frogs in the fall of the year; others transform the following spring when about one year old, but never any longer in the State of Louisiana. The green frog requiries two seasons to complete its development, and these tadpoles hibernate in the mud during the cold season with the adult frogs and toads.

YOUNG

The exact time that it takes a frog to reach the adult stage in this climate is not yet fully determined, but from field observation it is not more than three

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Lovely Louisiana

PHOTOGRAPHIC STUDIES BY DELCROIX

. . . . this unhurried by-way meanders through the tranquil beauty of Louisiana woods . . . . flecks of dancing sunlight pursued by purple twilight shadows . . . . the thirsty hound reminds us that his master is nearby . . . .

Lovely Louisiana

. . . . the great oak is typical of the Louisiana scene . . . . through its overhanging boughs and leaves there is the interlacing pattern of sunlight and shadow . . . . a serenity that suggests there yet may be "peace on earth" . . . .

Lovely Louisiana

. . . . through these trees, across the picturesque Bayou Barataria, there is a dim vista of enchantment . . . . a distant farm-house bathed in the early morning sun . . . . the faint chug-chug of a motor, then solitude again . . . .

Lovely Louisiana

. . . . the country road bordered by trees festooned with Spanish moss that stirs gently in the breeze . . . . Nature is encountered here in one of her seductive moods, inviting the wayfarer to tarry awhile and renew his joy in the simple ways of life . . . .

Louisiana's Bull-Frog Goes To Town!

[Continued from Page 26]

years. It seems to be able to spawn at about four years. This naturally depends upon the food supply, and even during the first year the frogs vary considerably in size.

ADULTS

The bullfrog appears to reach maturity in about four years and probably spawns for several successive years. During the breeding season the adults gather together in colonies, but by May or June the chorus begins to disband and the individuals scatter over a large territory in search of food. Until the first chilly days of September the bellow of the common bullfrog and the hog-like grunt of the lake frog, can be heard, although not in the same intensity as during the breeding season.

Size is not a fair criterion of the age of a bullfrog or even its identity. Variation in size is remarkable, and is dependent on the size of the tadpole at the time of the metamorphosis and on an abundance or lack of food thereafter. It is to be understood that tadpoles have a tendency to transform in periods of drought regardless of age or size, and the young frog is small or large at the beginning of its new life accordingly. When the tadpole absorbs its gills it does not deprive its successor, the frog, of means of breathing under water. The frog's moist skin is like a great gill extending all over the body. In consequence, the animal under certain conditions can live under water for long periods.

The bullfrog is ever alert, with tensed muscles, in expectation of passing prey or in escaping from animals that prey on him. When a quadruped brings down his deadly paw suddenly on a frog sitting on a bank, like the Irishman's flea the frog is not there. A heron has no chance of a capture if the frog be on a bank. But centuries of contest have not taught the frog to cover his posterior parts when he burrows in the mud for concealment, and he does not see his greatest enemy except man, the snake. And so the contest goes on in Nature's effort to maintain a proper balance of life, for Nature is the most cruel and relentless of tyrants. The bullfrog eats the crayfish, the crayfish eats the small frogs and the tadpoles, and predacious enemies destroy both *sans merci.*

As frogs are nocturnal in their habits, hunting can profitably be carried on only at night with the aid of an acetylene torch worn on the head. During the day frogs are seldom seen because of their close resemblance to their surroundings, and the few seen can make their escape by diving. At night, however, frogs are easily found, as the call of *R. catesbiana* can be heard half a mile or more, and *R. grylio* at about half that distance. When approached, the rays of the light render their eyes luminous and every frog within the radius of a hundred yards becomes visible. In the spring when the frogs are banded it is only a matter of catching as many as one can carry home.

Fortunately for the species, they breed in the deeper sections of the swamp, which are farthest from the ridge lands, and, as those localities can usually only be reached on foot, a hunter cannot take away more than sixty or seventy frogs in a night. Eventually, however, they are thinned out but not before a majority of pairs succeed in depositing their spawn. Because of their color-mimicry and power to change their color to suit surroundings, many bullfrogs are able to escape their enemies by lying *flat*, as they are usually marked to resemble the shadows cast by the sun or moon shining through the trees. This, of course does not aid them in escaping their hunters at night as their eyes are visible. They have other instincts which are of a distinct advantage, however; the sudden splash of one frog puts all others within sound on the alert, and if one escapes the others will dive for safety also. Furthermore, if a frog is caught or handled roughly it will utter a scream, and thus puts all other frogs in the neighborhood on close watch for an enemy, and makes them difficult to catch. Still another social instinct puts frogs on the lookout for enemies. If many frogs are singing together in a chorus and one is caught, the stopping of its voice is a warning of danger, and not another cry is heard from a single member of the colony until the danger has apparently passed.

In studying the frog it has been noticed that in places where frog hunting is carried on extensively, that by summer large specimens are difficult to obtain. It has also been found that where small sizes are caught during the summer practically no large frogs are to be found the following spring and the collector must seek new hunting grounds. This sort of hunting, consequently, almost exterminates the species in those localities, as there are no eggs laid to start the growth of future generations, or if a few solitary pairs do escape, the few thousand tadpoles which develop are scarcely enough to satisfy their natural enemies which have not diminished in numbers. In certain localities where many frogs have been collected during the past seasons, and the medium and small specimens have not been disturbed, the supply of adults seems constant. In one breeding hole, covering only a few acres located in a St. Charles Parish swamp, many large frogs have been obtained for several successive years, yet during ten days' time, 918 specimens were secured and the number seems hardly diminished, and no doubt several thousand still remain. This is probably one of the largest squads of bullfrogs in existence.

There are three grades of marketable frogs—Jumbo, medium, and small. Prices shot up startingly during the World War, with disastrous effect on the species. The market originally took only Jumbo and the next larger grades. At that time no *R. grylio* were sold. When the large frogs became scarce the smaller sizes were marketed, and at the peak of the high cost of living the extinction of the species seemed threatened. This marketing of the smaller grades opened new territory, however, and new hunters appeared in new fields and these caught only the larger individuals. This extension of territory ruined the market for small frogs, and many dealers began to discourage the taking of immature specimens. Actual demonstration has shown that by taking only the larger sizes, a hunter cannot deplete his territory.

The following table gives the living weights and those of the dressed meat of a series of male bullfrogs:

Length of head and body Inches	Weight of living frog Ounces	Increase of weight Ounces	Weight of dressed meat Ounces
5½	8½		5½
6	10½	2	6½
6½	13	2½	8
7	17	4	11

With the females in the breeding season, owing to the weight of the eggs, the living weights of a similar series would be relatively higher, but this does not affect the prices paid, as bullfrogs are not sold by weight.

An important fact clearly brought out by this table is that with a uniform increase in the length of a frog there is a progressive increase in the weight, which manifests itself in the dressed meat.

◆

The Piranha is a man-eating fish native to the Amazon River. It travels in immense schools which rend and devour any wounded man or beast in a few minutes.

In the streams of Central and South America is a genus of the so-called "four-eyed fish." It does not actually have four eyes, but each eye is divided into two parts by a membrane. The upper part of the eye is adapted for vision in the air, and the other in the water. They swim at the surface with the upper half of the eye above water.

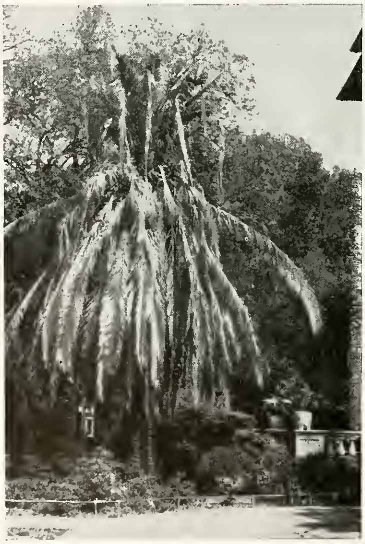
Destruction of Exotic Woody Plants by the Extended Freeze In January, 1940

by
Wm. T. Penfound and
Frank G. Mackaness

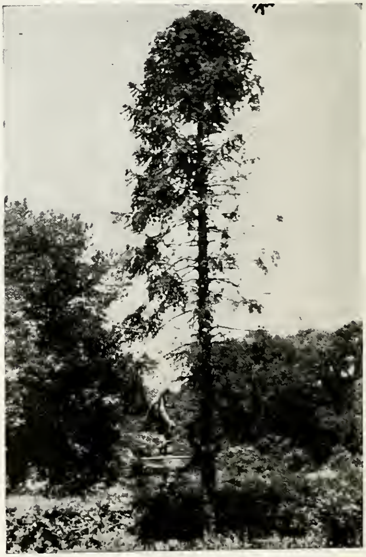
A continuous cold wave of twelve days duration from January 18 to January 29, 1940 resulted in widespread destruction of vegetation in the city of New Orleans. During the cold wave the temperature reached the freezing point on twelve successive nights, the lowest (20° F.) being reached on January 19. This resulted in an average daily temperature of 34.9° F. for the month as compared with the long term average of 54.9° F. The cold wave was preceded by six months of relatively clear weather with an accumulated deficit of 10.80 inches of rainfall for the period as compared with the long-term average. The average daily temperatures for this six-month period were slightly above normal, but during the early part of January, 1940, they were below normal and became progressively lower to the time the abnormal cold wave was ushered in on January 18. These conditions are favorable for the production of cold hardiness in plants and were undoubtedly responsible for the low mortality that resulted from the cold wave in 1940.

The above conditions contrast strikeingly with the weather conditions that prevailed previous to the very destructive freeze of January 22 to January 25, 1935. During the six months period prior to January 22, 1935 the rainfall was slightly higher (1.44 inches) than normal. The average daily temperatures for this period were considerably above the normal, however. Furthermore, the daily temperature increased gradually throughout January until the inauguration of the cold wave on January 22, 1935. As an example, the minimum daily temperatures during the previous week were as follows: 54, 53, 60, 67, 63, 66, 68. That this unusually warm, moist weather was indirectly responsible for the frightful destruction that occurrred in 1935 can hardly be questioned. Entire trees of the monkey puzzle were killed outright as were many fragrant viburnums and oleanders. This occurred despite the fact that the lowest temperature (24° F.) was not as low as it was in 1940 (20° F.) and the fact that the period of freezing weather was only one-third that of the more extended cold spell of 1940.

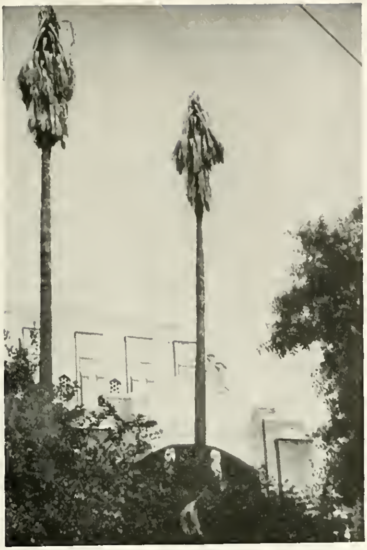
Although the destruction of plants in 1940 was not as great as it was in 1935, very few plants escaped some injury. This included many species of evergreen trees, shrubs, and vines on which no frost injury had been observed during



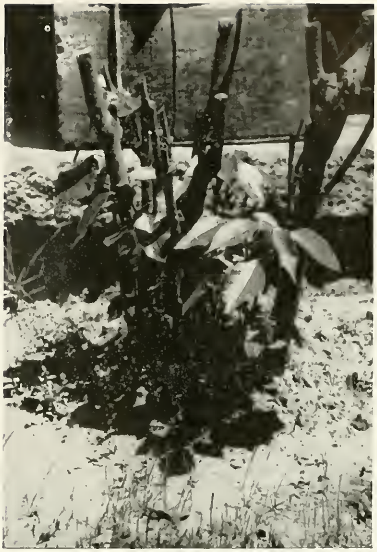
■ **Fig. 1. Although the Canary Isle Date Palm lost most of its leaves during the freeze, it is producing a new supply at the stem tip.**



■ **Fig. 2. Many of the branches of the monkey puzzle, especially on the northern exposure, were destroyed by frost.**



■ Fig. 3. The California Fan Palm presents a very bedraggled appearance two months after the freeze.



■ Fig. 4. The semi-evergreens, such as the poinsettia displayed here, were usually killed to the ground and many specimens never recovered.

the freeze of 1935. Notable among these were camphor, magnolia, and live oak.

DESTRUCTION OF LEAVES BY FROST

A few species of plants escaped frost injury completely during the extended cold snap in January, 1940. These included most of the conifers (deodar, red cedar, Japanese yew, and arbor vitae) and several broad-leaved evergreens: notably oleaster, holly, chinese-holly, oregon grape, pittosporum, butchers' broom, and spanish bayonet (Table I). Since this list includes some of our finest evergreen trees and shrubs, the planting of as many of these as possible would constitute good horticultural practice in the New Orleans area.

An examination of table I reveals the fact that a much greater number of woody evergreens received at least some injury (Fig. 1). Of more than passing interest is the fact that several species uninjured by previous freezes in the memory of the writer, suffered the loss of a considerable percentage of their leaves by frost. In some exposed specimens, this amounted to 50 per cent of the total number of leaves. This list includes camphor, magnolia, sweet olive, cherry-laurel, live oak, abelia, box, spindle-bush, cape jasmine, banana shrub, myrtle, and creeping fig. Despite the fact that frost injury was severe in exposed specimens, it is probable that the plants as a group experienced a loss of less than 20% of the total number of leaves. This list also includes a number of excellent evergreens and should be given preference over those in Table II for street and garden planting in the city of New Orleans.

The assemblage of evergreen and semi-evergreen plants in Table II experienced widespread destruction. This includes some of our best loved plants such as the goldendrop, poinsettia, paper plant, rose-of-china, chinese fan palm, and the california fan palm. (Fig. 3, 4.) All of these plants, except in very protected places, lost their entire complement of leaves. In general this was also true for the rest of the assemblage in Table II.

DESTRUCTION OF PLANTS BY FROST

What concerns the gardening public more than the destruction of leaves which may be a temporary phenomenon is the fate of the entire plant. In general it may be stated that the damage to the shoot paralleled that of leaf injury. On this basis it would be anticipated that very few of the species in Table I would have been destroyed by the freeze whereas those listed in Table II would suffer considerable loss. Such has proved to be the case.

Of the species in Table I certain exposed specimens of the oleander were completely destroyed. It is possible also that exposed plants of certain other species may not recover but lack of such recuperation has not been observed. It is evident, therefore, that most of the evergreen trees, shrubs, and vines in the New Orleans area were able to withstand the prolonged period of cold weather of January, 1940, without permanent injury.

Such is not the case with certain other woody evergreen species (Table II) that are planted in New Orleans. Of the true evergreens it is probable that certain specimens of monkey puzzle, moonseed, giant bamboo, rubber plant, and california fan palm will never again produce new shoots (Fig. 2, 3). It is possible also that certain other evergreen species in Table II should be included in this list.

Although detailed observations have not been made on the recuperation of the semi-evergreens it is known that they fall into two categories:

a. Plants with stems and buds uninjured such as rough dogwood, hydrangea, photinia, weeping willow, and elderberry.

b. Plants with stems killed such as allamanda, night jasmine, cashmere bouquet, angels' trumpet, giant bamboo, goldendrop, poinsettia, rose-of-china, Jacaranda, Turks' cap, ham and eggs, trailing lantana, barbados-cherry, Thryallis, Thevetia, and leadwort.

Of the above species it has been observed that many of the allamanda, giant bamboo, poinsettia, rose-of-china, Jacaranda, Thryallis, and Thevetia specimens show no evidence of recovery (Fig. 4). It is evident, therefore, that many of the semi-evergreens are very susceptible to frost injury and should be planted very judiciously in the city of New Orleans.

SUMMARY

The extended freezing weather that occurred in January, 1940 was one of the coldest periods in the history of New Orleans. Despite this fact the destruction of cultivated, mostly exotic, evergreens was much less than in January, 1935. This was due to the relatively dry and progressively colder weather that prevailed previous to the freeze in 1940. As a group the true evergreens suffered only slight injury. Exceptions to this rule were monkey puzzle, sago palm, moonseed, giant bamboo, rubber plant, chinese fan palm, and california fan palm. The semi-evergreens were all badly injured by the frost and many specimens were killed outright. It is our opinion that the evergreens listed above and all of the semi-evergreens should be planted with discretion in the city of New Orleans. The impression upon our spring visitors by the legion of bedraggled palms, shrubs, and vines in our city was anything but favorable. If we are to make New Orleans "America's most beautiful city," we must use great care in the future in the selection of exotic woody plants for our gardens, streets, and parks.

On the following game birds there is no open season in Louisiana: Swan, wood-duck (branchu), prairie chicken, whooping and sandhill cranes, curlews, upland plover, (papabotte), kildeer, red-breasted snipe, "Chorook" and other sandpipers, plovers, yellowlegs, and all shore birds except snipe and woodcock.

Two birds, the wood-duck and the woodcock, both common in Louisiana, are among species which are known to carry their flightless young. Three methods of transport of the young by the parent bird have been established by observation; the carrying of the young by the neck in its mother's beak, the carrying of the young held between its mother's feet, and the transfer of the young by climbing on their mother's back enabling her to ferry them from their high home to the water surface. The young are carried away one at a time.

Table 1. Destruction of leaves by extended freeze in January, 1940, slight to moderate (0% to 25%).

PALMS

Scientific name	Common name
Butia capitata	Coconut palm
Chamaerops humilis	European fan palm
Phoenix canariensis	Canary Isle date palm
Phoenix sylvestris	Forest date palm
Sabal palmetto	Palmetto
Trachycarpus fortunei	Sawtooth palm
CONIFEROUS TREES AND SHRUBS	
Cedrus deodara	Deodar
Juniperus virginiana	Red cedar
Podocarpus macrophylla	Japanese yew
Thuja orientalis	Oriental arbor vitae
BROAD-LEAVED EVERGREEN TREES	
Cinnamonum camphora	Camphor
Eriobotrya japonica	Japanese plum
Ligustrum japonicum	Chinese privet
Magnolia grandiflora	Magnolia
Osmanthus fragrans	Sweet olive
Prunus caroliniana	Cherry-laurel
Quercus nigra	Water oak
Quercus virginiana	Live oak
EVERGREEN SHRUBS	
Abelia grandiflora	Abelia
Azalea elegans	Azalea
Bambusa spp.	Dwarf bamboo
Buxus sempervirens	Box
Camellia japonica	Camellia
Cassia corymbosa	Senna
Eleagnus pungens	Oleaster
Evonymus japonica	Spindle-bush
Gardenia jasminoides	Cape jasmine
Ilex opaca	Holly
Jasminum primulinum	Yellow jasmine
Ligustrum coriaceum	Leathery privet
Ligustrum vulgare	Common privet
Mahonia fortunei	Chinese-holly
Mahonia japonica	Oregon-grape
Michelia fuscata	Banana-shrub
Myrica cerifera	Wax myrtle
Myrtus communis	Myrtle
Nerium oleander	Oleander
Pittosporum tobira	Pittosporum
Rosa spp.	Rose
Ruscus aculeatus	Butchers broom
Viburnum odoratissimum	Fragrant viburnum
Viburnum suspensum	Arching viburnum
Yucca aloifolia	Spanish bayonet
EVERGREEN VINES	
Clytostoma callistegioides	Purple bignonia
Doxantha unguis-cati	Cat's claw
Ficus pumila	Creeping fig
Hedera helix	English ivy

The Lure of the List

by
Guy Emerson

(Editorial Note: Mr. Guy Emerson, author of this unusual article which appeared in "Bird-Lore", is the Vice-President of the Bankers Trust, New York City, one of America's foremost financial institutions. Mr. Emerson is also treasurer of the National Association of Audubon Societies. It is interesting to note how Mr. Emerson, despite the heavy demands of his profession, has developed his startlingly efficient and productive interest in birds.

Mr. Emerson is one of the few ornithologists to have seen the Ivory-billed Woodpecker, which he travelled halfway across a continent to find in a remote Louisiana Department of Conservation sanctuary, possibly the only place where this magnificent bird still survives.)

Starting in Boston over forty years ago, I have kept lists of birds seen in various parts of the country. As an amateur, usually closely restricted by business duties, list-making has been an incident rather than a main pursuit. Yet, at times, the annual lists have been large. In 1939, owing to unusual opportunities to visit both the Atlantic and Pacific coasts and the South, the year's list of species and subspecies reached 674.

I may say at the outset that the habit of list-keeping has brought to me personally, aside from the joy of an absorbing hobby, many important benefits. First of all, it has lured me away from an unbalanced absorption in the affairs of business and other responsibilities of city life. It has contributed greatly to consistent good health, mentally as well as physically, in an age of unnatural pressure. No interest I know of can do so much to keep eyes and ears keen, and to keep a man's legs under him—perhaps the best preventive known for premature old age. Next it has taken me out of the beaten paths, the gardens, parks, and golf courses of the world, and into the prairies, marshes, riverbottoms, lakes, swamps, deserts and mountains of forty states. I owe to the lure of the birds a knowledge of outdoor America, with all its amazing interest and beauty, which I should never have acquired otherwise. Added to this is the opportunity to know people who are close to the soil to the woods, to the waters—quiet people with different ways of living, and simpler tastes than those of city dwellers; people with long vistas in their eyes, strong, unworried people close to the heart of America. This has been not the least of bird-hunting joys.

As to my 1939 list, I am told it may comprise the largest number of varieties ever seen by one observer in a single year in the United States. At any rate, it is probably the largest list made in a year by an amateur in the intervals of business. Whether or not it is the largest is not important, but it is of some interest to know many varieties of birds can be seen in this country in a year. It should also be said promptly, and gratefully, that this list is a cooperative venture. It was possible only through the aid of twenty competent and generous field observers, men and women who know their territories intimately, and who were kind enough to guide me into their favorite haunts and hiding-places. In fact, practically all the birds on my 1939 list were identified by one other field observer besides myself.

In talking with some of the best field men in the country, I have wondered how large a list could be built up, just for the fun of the game, in a single year. It has been suggested that a man with a year on his hands, and a small fund to invest in the undertaking, could manage to see 700 to 750 species and subspecies of birds in the United States during a twelve-months' period. I have figured out roughly that there are "reasonably probable" in the United States (as listed in the A. O. U. check list of 1931) about 591 species and 497 subspecies, or a total of 1088. This eliminates casuals blown in from the sea, all those on the Alaska, Canada, and Lower California lists and all waifs and strays. One would need to plan his course carefully in advance, reaching all the richest spots at the best migration periods, cor-

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Table II. Destruction of leaves by freeze in January, 1940, extensive (26% to 100%).

EVERGREEN AND SEMI-EVERGREEN PLANTS

Scientific name	Common name
Allamanda cathartica	Allamanda
Antigonon leptopus	Rose-of-Montana
Araucaria bidwillii	Monkey puzzle
Arundo donax	Giant reed
Bougainvillea glabra	Bougainvillea
Cestrum nocturnum	Night jasmine
Citrus spp.	Oranges, etc.
Clematis jackmanii	Virgins bower
Clerodendron fragrans	Cashmere bouquet
Cocculus laurifolia	Moonseed
Cornus asperifolia	Rough dogwood
Datura suaveolens	Angels trumpet
Dendrocalamus spp.	Giant bamboo
Duranta repens	Goldendrop
Euphorbia pulcherrima	Poinsettia
Fatsia papyrifera	Paper plant
Ficus elastica	Rubber plant
Hibiscus rosa-sinensis	Rose-of-China
Hydrangea hortensis	Hydrangea
Jacaranda mimossaefolia	Jacaranda
Lantana camara	Ham and eggs
Lantana sellowiana	Trailing lantana
Livistona chinensis	Chinese fan palm
Malpighia glabra	Barbados cherry
Malvaviscus drummondii	Turk's cap
Parkinsonia aculeata	Jerusalem thorn
Photinia glabra	Photinia
Plumbago capensis	Leadwort
Salix babylonica	Weeping willow
Sambucus canadensis	Elderberry
Thevetia nereifolia	Thevetia
Thryallis glauca	Thryallis
Washingtonia filifera	California fan palm
Washingtonia robusta	Washington fan palm

Ground Water In Grant and LaSalle Parishes, Louisiana

by
J. C. Maher

INTRODUCTION

A portion of all the rain that falls on the surface of the earth percolates downward through surficial materials until it finally reaches a zone in which the rock is completely saturated. The water in this saturated zone is the body of ground water. The gently undulating surface of this body of ground water is known as the *water table*. The water table follows the topograph, in general, being at a higher altitude in the hill land than in the low land (see figure 1). The movement of the ground water is always in the downslope direction of the water table toward the lakes and streams in which it may emerge at the surface. The water in wells penetrating the water table does not rise in the well casing.

In some regions, such as central Louisiana, inclined permeable formations are underlain and overlain by relatively impermeable beds. Water falling as rain upon the beveled outcrop or intake areas of these permeable formations percolates downward until it becomes confined between the inclined impermeable beds. Further percolation is restricted to lateral movement in the conduit and the water is under what is termed *artesian pressure*. The water in a well penetrating this reservoir at any locality that is structurally lower than the intake area will rise in the casing (see figure 1). Such a well may be called an *artesian well* whether or not the pressure is sufficient to cause it to overflow at the surface. The principal industrial and municipal water supplies of central Louisiana are derived from artesian wells which do not flow.

Grant and LaSalle Parishes are situated in the central part of the State of Louisiana. Little River forms the mutual boundary between the two Parishes. Grant Parish, the westernmost, is separated from Natchitoches Parish on the west by the Red River, and is bordered on the north by Winn Parish and on the south by Rapides Parish. It has an area of 638 square miles.

LaSalle Parish is bordered on the north by Winn and Caldwell Parishes, on the east by Catahoula Parish, and on the south by Rapides Parish. It has an area of 640 square miles.

GEOLOGY

General features

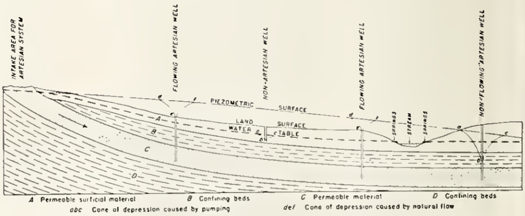
Louisiana is a part of the Gulf Coastal Plain and the Mississippi River Flood Plain which were formed by the nearshore deposition of alluvium in the Gulf Coast Geosyncline during Cenozoic time. The older Eocene sediments are found at the surface in northern Louisiana with progressively younger formations cropping out toward the gulf of Mexico. Regionally, the rate of southward dip ranges from about 20 feet per mile in the north part of the State to more than 200 feet per mile in the south part.[1] The sediments thicken toward the south, reaching an estimated maximum thickness of 30,000 to 40,000 feet[2] at the coast.

The principal structural features are the Sabine-Uplift, the Monroe Uplift, the Angelina-Caldwell flexure and the Mobile-Tunica flexure.[3] The most prominent feature is the Sabine Uplift, which occupies most of the north-western portion of the State and is separated from the Monroe Uplift in the northeastern part by a synclinal area containing salt domes and minor folds. In the central part of Louisiana a monoclinal fold, known as the Angelina-Caldwell flexure, extends in a northeastern direction from Sabine Parish to Caldwell Parish. A similar fold is present in the "Florida Parishes" of Louisiana, east of the Mississippi River. According to Howe,[4] who has named this feature the Mobile Tunica flexure, the monoclinal folding reaches from near the mouth of Mobile Bay to the Tunica Hills of Wilkinson County, Mississippi, and the northern section of East and West Feliciana Parishes, Louisiana.

Eocene Series

CLAIBORNE GROUP

The oldest formations penetrated in drilling water wells in Grant and LaSalle Parishes are those of the lower Claiborne group of Eocene age. Only two water wells are thought to have been drilled below the Cockfield formation. One of these was the recent test well at Montgomery, drilled to a depth of 900 feet before being abandoned. The other was the water well drilled by the Urania Lumber Company at Urania. This well is reported to have been completed at a depth of 1050 feet in a sand about 48 feet thick, which yielded brackish water under sufficient pressure to flow at the surface. A comparison with the generalized section for the Urania oil fields as published by Schneider[5] leads to the conclusion that the water in the Urania Lumber Company well was from the Sparta sand.



■ **Figure 1. Diagram illustrating artesian and non-artesian conditions.**

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[1] Howe, H. V., Louisiana Petroleum Stratigraphy: Louisiana Dept. Cons. Gen. Min. Bull. 27, p. 20, 1936.

[2] Howe, H. V., Op. cit., p. 3, 1936.

[3] Howe, H. V., Op. cit., p. 20, 1936.

[4] Howe, H. V., Op. cit., p. 20, 1936.

[5] Schneider, G. W., Urania oil field, LaSalle, Winn, and Grant Parishes, Louisiana: Structure of typical American oil fields, vol. 1, p. 93, 1929.

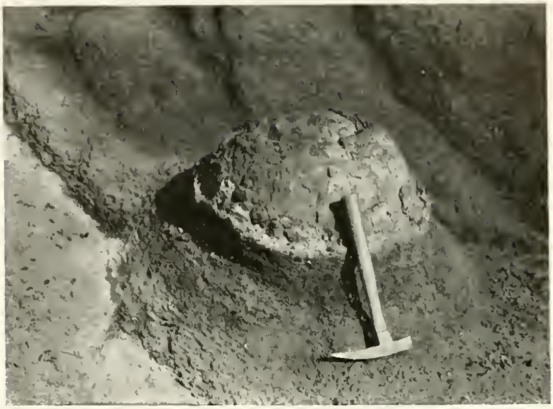
Generalized section of formation in the Urania oil field (Schneider)

Tertiary	feet
Eocene	
Jackson	200
Claiborne group	
Yegua formation	500
(Cockfield)	
St. Maurice (restricted)	185
(Cook Mountain)	
Sparta sand	430
Cane River	220
Wilcox	1500

The Sparta sand and the Cook Mountain, (the St. Maurice, restricted, of Schneider's section) neither of which outcrop in Grant and LaSalle Parishes, have been described in the Urania field by Schneider as follows:

"The Sparta sand is dominantly sandy but contains some beds of clays and sandy clays. The basal 30 feet of the Sparta sand is a massive sand, which has yielded showings of oil and gas. It is followed by 100 feet of interbedded clay and sand. Overlying this member is 40 feet of sand, in part lignitic, which is followed by 80 feet of dark gray to brown micaeous and lignitic clay, containing fossil leaves. The upper 180 feet is made of massive sands. In general the sands are gray and the clays light gray to brown with the brown predominating."

The St. Maurice (Cook Mountain) formation is made up of alternating beds of sandy clay, massive beds of glauconitic sand, laminated beds of sands, lignitic clays, and indurated beds of sandstone, containing many fossil casts. The prevailing colors are light gray and brown.



■ **Figure 4. Calcareous concretion in the Cockfield formation, Montgomery Landing, Grant Parish.**

These formations, as well as the earlier Teritary strata directly below, are deeply buried in most of the two Parishes. The presence of brackish water in the Sparta at Urania and in the Cockfield at Colfax indicates that these Eocene sediments below the Cockfield probably would yield highly mineralized water in both parishes. For this reason, discussion of the water-bearing properties of beds below the Cockfield has been omitted in this article.

The present day Cockfield was named "Cocksfield" by Vaughan[6] in 1895 for the outcrop at "Cocksfield" ferry at Petite Ecore. Veatch[7] in 1906 corrected this spelling to "Cockfield", corresponding to the name of the plantation owners at Petite Ecore.

The Cockfield formation crops out in northern Grant Parish in the vicinities of Montgomery and Packton, and in the northwestern corner of LaSalle Parish. It is composed of about 500 feet of light gray and brown lignitic silty clays, silts, and sands with small lenses of lignite. It is characterized by numerous fossil leaves and other plant remains. The type locality of these beds is a steep bluff on the Red River above Montgomery called Petite Ecore (see figure 2). A lignite seam from one to three feet thick and two layers of siltstone are prominent in

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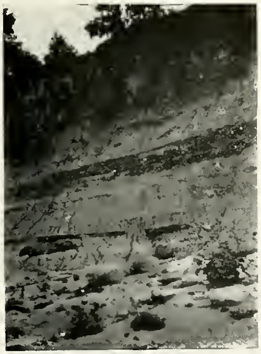
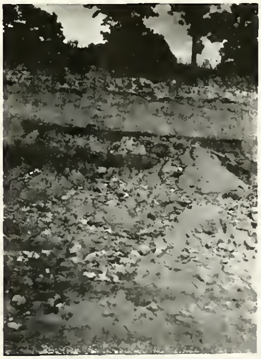
[6] Vaughan, T. W., The stratigraphy of northwestern Louisiana: Am. Geol. vol. 15, p. 220, 1895.

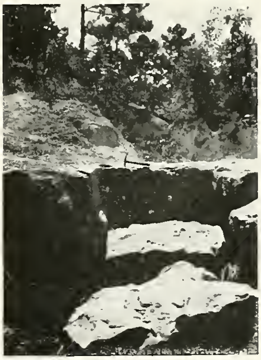
[7] Veatch, A. C., Geology and underground water resources of northern Louisiana and southern Arkansas: U. S. Geol. Survey Prof. Paper 46, p. 38, 1906.



■ **Figure 2. Type locality of the Cockfield formation at Petite Ecore on the Red River in northwestern Grant Parish showing prominent beds of lignite and siltstone.**



■ **Figure 3. Outcrop at Montgomery Landing, Grant Parish, showing the Moody's Branch marl of the lower Jackson which marks the transition of the Cockfield and Jackson units.**



■ **Figure 5. Outcrop of massive Catahoula sandstone in sec. 30, T. 6 N., R. 2 W., Grant Parish.**

this section. The following is a section of this locality as published by Fisk.[8]

	Ft.	In.
Quaternary materials		
Gray sandy soil..........		6
Mottled-gray clay lenses in sands and gravels......	2	
Silty clays, with irregular sands beds grading upward into light-brown silts which weather into characteristic pinnacle forms	17	6
Cockfield section		
Very compact, silty, well-indurated, mudstones grading downward into beds of massive argillaceous siltstone which contain many plant fossils (palm fronds, etc.). The fossiliferous beds are characterized by a sulphur-yellow efflorescence	8	
Dark-gray to black, poorly bedded, lignitic silts interfingering with a thin, lenticular (less than 1 foot to 3 feet thick) seam of peaty lignite	5-8	
Dark-gray lignitic silts (weathering to light-gray with yellow efflorescence) grading downward into massive, lenticular, siltstone with abundant plant fragments	14	
Black lignitic silts, with twigs, stems, leaf impressions; characterized by yellow efflorescence and interbedded with micaeous fine sands. Lenticular massive siltstones are present in two horizons, each characterized by septarian concretions and locally associated with well-defined cone-in-cone structures. Gypsum crystals are common in the sandier lenses and along bedding planes . . .		
Total maximum exposed thickness of Cockfield formation	68	

At Montgomery Landing the transition of the Cockfield into the Jackson is well exposed (see figure 3). A zone of calcareous concretions (see figure 4), ranging in size from less than an inch to more than a foot, are found here about 25 feet below the base of the Jackson. The formation of these concretions has been attributed by Fisk[9] to the local accumulation of calcium carbonate about fossil wood fragments through ground water action on the overlying calcareous Jackson strata.

Though no sands are exposed in these outcrops, several sands of considerable thickness have been observed on the surface in Caldwell Parish to the north. Particularly massive sands of the Cockfield are exposed at the town of Columbia, and 2 miles south of Columbia in NE. ¼ sec. 32, T. 13 N., R. 4 E. Such exposures serve as means of recharge for the water sands of the Cockfield in Grant and LaSalle Parishes.

The Cockfield formation yields highly mineralized water in all of this area except the northwestern part of LaSalle Parish. Deep tests at Colfax, Montgomery, and Rochelle have yielded brackish or salty water from this formation. The water from the Colfax well which was examined in the laboratory[10] contained over 19,900 parts per million of chloride. The well at Montgomery was reported to have yielded a reddish-colored water testing 616 parts per million of chloride from a depth of 260 feet before the well was abandoned. The test well at Rochelle was drilled previous to 1905 and abandoned after flowing salt water.

In northern LaSalle Parish, where the Cockfield formation is at or near the surface, wells as deep as 590 feet obtain fresh water from sands in this formation. Samples from seven wells in this area were examined in the laboratory. A majority of these samples had a distinct reddish or yellowish tinge which may be due in part to iron or organic compounds. The only two laboratory determinations of iron that were made, show a range of 0.10 parts per million to 1.76 parts per million of iron content. The chloride content of the samples from the seven wells ranged from 27 parts per million in a well at Urania to 328 parts per million in a well near Standard. The hardness covered a wide range, from 4.5 to 164 parts per million. Considerable amounts of sulphate and bicarbonate were found in the samples. The sulphate content ranged from 4 to 470 parts per million and the bicarbonate content, from 357 to 821 parts per million.

Among the minor constituents found in the water from the Cockfield formation was a small amount of fluoride. Fluoride in water used for drinking or cooking is associated with mottled enamel of the teeth which is made apparent by dull, chalky-brown enamel, brown stains and pitting of the enamel. All of the water samples, except that from the municipal well at Olla, contained over one part per million, the permissible maximum.[11] The largest amount, 6 parts per million, was present in the sample from the Urania Lumber Company well which supplies the Town of Urania. The presence of fluoride in ground water of central Louisiana has been reported previously.[12]

JACKSON GROUP

The term Jackson was applied by Conrad[13] in 1855 to fossiliferous beds near Jackson, Mississippi. The term was first used in Louisiana by Hilgard[14] in 1869 when he utilized it in connection with outcrops in the general area of Grant and LaSalle Parishes.

The relatively easily eroded sediments of the Jackson group form part of the lowlands which parallel the scrap of the Catahoula sandstone known as the Kisatchie Wold. These materials are found at or near the surface in the northern one-third of Grant Parish and most of the northwestern part of LaSalle Parish. The very fossiliferous Jackson group has been subdivided[15] into the Moody's Branch marl (oldest), Yazoo clay, and the Danville Landing beds.

The Moody's Branch marl consists of very fossiliferous glauconitic sands which grade downward into the lignitic, silty clays of the Cockfield formation. This transition zone is from 8 to 12 feet thick at Montgomery Landing where it is well exposed (see figure 3).

The Yazoo clay is composed of fossiliferous, lignitic, and sandy clays with lenticular sands. These have been subdivided and described by Fisk[16] as follows (oldest to youngest):

"The Tullos member consists of a series of clays, ranging in thickness from 75 to 175 feet, which are lithologically similar to those described from Yazoo City (Miss.). Clays in fresh exposure have a deep blue-gray color but upon weathering they range to a drab yellow, or light-gray, eventually breaking down into black soil."

"The Verda member, the most extensive member of the Jackson group, appears in a great number of exposures in both Grant and LaSalle Parishes. It consists of a series of sparingly fossiliferous, brackish-water lignitic clays and interbedded silty sands, with intercalated lenticular marine sandstones, fresh-water leaf-bearing silts and marine clays which have an aggregate average thickness of 200 feet."

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[8] Fisk, H. N., Geology of Grant and LaSalle Parishes: Louisiana Dept. Cons. Geol. Bull. No. 10, pp. 83, 84, 1938.

[9] Fisk, H. N., Op. cit., pp. 84, 85, 1938.

[10] All laboratory determinations made by M. D. Foster, J. D. Hem, and F. H. Davis of the Federal Geological Survey.

[11] Dean, H. T., Chronic endemic dental Fluorosis: The Journal of the American Medical Association, vol. 197, pp. 1269-1272, 1936.

[12] Louisiana State Board of Health, Mottled enamel and water supply: Louisiana St. Bd. Health Quart. Bull., vol. 26, no. 4, p. 15, New Orleans, 1935.

Maher, J. C., Fluoride in the ground water of Avoyelles and Rapides Parishes, Louisiana: Louisiana Dept. Cons. Geol. Pamphlet no. 1, 1939.

Maher, J. C., Ground water resources of Rapides Parish: Louisiana Dept. Cons. Bull. 17, pp. 41, 42, 1940.

[13] Conrad, T. A., Observations on Eocene deposit of Jackson, Miss., with descriptions of thirty-four species of shells and corals: Acad. Nat. Sci. Philadelphia Proc., vol. 7, pp. 257-263, 1865.

[14] Hilgard, E. W., A preliminary report of a geological reconnaissance of Louisiana: Office of De Bow's New Orleans Review, p. 9, 1869.

[15] Hanna, M. A., and Gravell, D. W., Shreveport Geological Society Guidebook for 11th annual field trip, opp. p. 30, 1934.

[16] Fisk, H. N., Op. cit., pp. 98, 100, 1938.

The Danville Landing beds of Hanna and Gravell are composed of interbedded sands and clays about 40 feet in total thickness. These beds grade upward into the overlying Vicksburg group and downward into the Yazoo clay.

The Jackson group is relatively unimportant as a source of water. Only a few shallow wells have been finished in these sediments which yield very small quantities of bad tasting water. The water is usually highly mineralized. The difficulty in securing good water from the Jackson sediments probably is responsible, in part, for the sparcity ot population in the lowland area north of the Kisatchie Wold.

Oligocene Series.

VICKSBURG GROUP

The name, Vicksburg, was originally used by Conrad[17] in 1846 to designate certain fossiliferous exposures at Vicksburg, Mississippi. Hilgard[18], in 1869 and Hopkins[19], in 1871 reported the presence of Vicksburg beds in the region of Grant and LaSalle Parishes.

The sediments of the Vicksburg group which crop out in central Grant and LaSalle Parishes consist of lenticular sands and sandy clay, thin fossiliferous limestones, and lignitic and gypsiferous shales with a total thickness of 200-300 feet.[20] Due to the non-resistant character of these beds, most of the outcrops are poorly exposed and occupy the lowlands paralleling the Kisatchie Wold. The relationship of this group with the overlying Catahoula sand stone has long been a basis of disagreement by Gulf Coast geologists[21]. The most recent report[22], on this area, however, shows that the Vicksburg group are present as far west in the State as the Red River and supports the contention of a transitional and conformable contact with the Catahoula sandstone.

The Vicksburg sediments, as a whole, are relatively impermeable and yield only small amounts of water. The water is often found to be highly mineralized and to have a dark color due to organic materials. No satisfactory water supplies are known to have been developed from the Vicksburg group in this area.

Miocene Series

CATAHOULA FORMATION

The sediments now classed as lower Miocene or Catahoula in age were first described by Wailes[23] under the name of Grand Gulf. The name Grand Gulf was retained in the literature by Hilgard[24], Vaughan[25], and others until 1906, when Veatch[20] proposed the term Catahoula. The Catahoula was still regarded as Oligocene in age by Matson and others[27] until the Tampa limestone, regarded as its equivalent in Florida, was referred to the Miocene by Cooke and Mossom[28].

The outcrop of the Catahoula formation forms the line of hills across Lousiana termed the Kisatchie Wold by Veatch[29]. These hills occupy the southern portion of Grant Parish and the southeastern part of LaSalle Parish. The lithology of the Catahoula sandstone has been well described by Matson.[31]

"The Catahoula sandstone consists of alternating sandstones and sands, with lenticular beds of clay, the arenaceous sediments predominating. Conglomerates are rare, though small quartz and chert pebbles occur in some of the layers of sand, and pebbles of clay are found at many localities and at different stratigraphic horizons. The formation is non-marine but was deposited near the strand line, where small bodies of brackish water were isolated and, on evaporation, formed precipitates of salt and gypsum. The streams that transported the materials now constituting the formation had varying velocities and made deposits ranging in texture from clay to fine-grained conglomerates. The floods that transported the coarse materials eroded the surfaces of existing clay deposits, this forming irregular contacts and incorporating more or less rounded fragments of the clay in the sands. The fossils, which are rare, are mostly leaves, but molluscan remains occur at a few places."

Volcanic glass shards have been observed in this formation by several writers[32]. This tuffaceous material is perhaps most evident in the matrix of some of the quartzitic sandstones in the lower part of the formation. Beds of reworked bentonite are present in Sabine Parish, where it is being mined for drilling mud.

The Catahoula formation is one of the most important sources of water in the State of Louisiana. The sands are fairly persistent, as evidenced by the flowing wells along the Red River, but vary considerably in thickness and permeability. Very few deep wells have penetrated the Catahoula formation in LaSalle Parish, and not over twenty in Grant Parish, principally because good water, in quantities sufficient for farm needs, is available at shallower depths from the terrace deposits overlying the Catahoula formation.

Samples from 12 deep wells which yield water from Catahoula sands ranged from 6 to 138 parts per million in hardness and from 6 to 1225 parts per million in chloride content. The more highly mineralized samples came from wells near Colfax in western Grant Parish and at Jena in central LaSalle Parish, which penetrate the basal members of the Catahoula formation. The remainder of the samples were low in hardness and chloride with considerable amounts of bicarbonate. The presence of the large amounts of bicarbonate together with the softness suggests that this water has been naturally softened by base exchange.[33]

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[17] Conrad. T. A., Observations on the Eocene formation of the United States. with descriptions of species of shells occurring in it: Am. Jour. Sci., vol. 51, pp. 209, 210, 1846.

[18] Hilgard, E. W., Op. cit., p. 8, 1869.

[19] Hopkins, F. V., Second annual report of the Geological Survey of Louisiana to the General Assembly: Louisiana St. Univ. Ann. Rept. for 1870, geological map, 1871.

[20] Fisk, H. N., Personal communication.

[21] Hilgard, E. W., The later Tertiary of the Gulf of Mexico: Am. Jour. Sci., 3rd series. vol. 22. p. 58, 1881.
Harris, G. D., and Veatch. A. C., A preliminary report on the geology of Louisiana: La. St. Exp. Sta., Geol. Agr. La., pt. 5, 1899.
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Howe, H. V., Review of Tertiary stratigraphy of Louisiana: Amer. Assoc. Pet. Geol. Bull., vol. 17, pp. 633, 634, 1933.
Chawner, W. D., The geology of Catahoula and Concordia Parishes: Louisiana Dept. Cons. Geol. Bull. 9, p. 132, 1936.
Fisk, H. N., Geology of Grant and LaSalle Parishes: Louisiana Dept. Cons. Geol. Bull. 10, p. 129, 1938.

[22] Fisk, H. N., Idem, pp. 125, 129.

[23] Wailes, B. L. C., Report on the agriculture and geology of Mississippi, pp. 216-219, 1854.

[24] Hilgard. E. W., Report on the geology and agriculture of the State of Mississippi, pp. 147-154, Jackson, Miss., E. Barksdale, 1860.

[25] Vaughan, T. W., A brief contribution to the geology and paleontology of northwestern Louisiana: U. S. Geol. Survey Bull. 142, p. 24, 1896.

[20] Veatch, A. C., Geology and underground water resources of northern Louisiana and southern Arkansas: U. S. Geol. Survey Prof. Paper 46, pp. 42, 43, 1906.
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[27] Matson, G. C., The Catahoula Sandstone: U. S. Geol. Survey Proof. Paper 98 (M), pp. 225, 226, 1916.
Maury, C. J., Comparison of the Oligocene of western Europe and the southern United States: Bull. Am. Paleontology, vol. 3, no. 15, p. 70, 1902.

[28] Cooke, C. W., and Mossom, S., Geology of florida: Florida Geol. Survey 20th Ann. Rept., pp. 78-93, 1928.

[29] Veatch, A. C., Op. cit., p. 39, 1906.
Veatch, A. C., Op. cit., pp. 42, 43, 1906.

[31] Matson, G. C., and Berry, E. W., Op. cit., p. 226, 1916.

[32] Howe, H. V., Review of Tertiary Stratigraphy of Louisiana: Am. Assoc. Pet. Geol. Bull., vol. 17, no. 6, (June) pp. 637, 639, 1933.
Chawner, W. D., Op. cit., p. 125, 1936.
Fisk, H. N., Geology of Grant and LaSalle Parishes: Louisiana Dept. Cons. Bull. 10, pp. 146-149, 1938.

[33] Renick, B. C., Base exchange in ground water by silicates as illustrated in Montana: U. S. Geol. Survey Water-Supply Paper 520, pp. 68, 69, 1925.

PLIOCENE (?) SERIES

The name, Citronelle formation, was applied by Matson[34] in 1916 to the highland sands, gravels, and clays which were earlier named Lafayette formation by Hilgard[35]. The age of the formation was considered to be Pliocene until Howe[36] questioned this classification in 1933, and Chawner[37] in 1936, placed the deposits in Catahoula Parish in the Pleistocene. In 1938, Fisk[38] included the formation in a series of Pleistocene terrace deposits.

Matson[39] described the Citronelle formation as follows:

"The Citronelle formation is predominantly sandy but contains varying amounts of clay in the form of thin layers or lenses. The relative proportion of materials of different kinds varies from place to place, and in any one section it varies from top to bottom, though in general sand is everywhere abundant and at many places there is some gravel . . .

"The sands of the Citronelle formation are sufficiently rounded to indicate that they have been subjected to extensive attrition. The pebbles vary greatly in degree of rounding; many of them are much waterworn and resemble pebbles found on the beach, others are only slightly rounded, and still others are subangular. The sand is predominantly quartz, and the pebbles in the Mississippi embayment are mostly chert, with a somewhat smaller percentage of crystalline quartz and quartzite. Many of the chert pebbles contain cavities lined with chalcedony in the form of agates or geodes, and large numbers of them are fossiliferous, containing fragments of corals, crinoid stems, and other organic remains such as are common in the Paleozoic limestones and chert . . .

"The clays vary greatly in character, some of the beds being relatively pure and others distinctly sandy. On the whole the sandy clays predominate, and in many places thin layers of sand are found in the clay beds. . . .

"The texture of the formation in any particular locality depends entirely on the arrangement and relative percentages of the different kinds of materials. In general, the sands form more or less continuous beds containing lenses of pebbles or clay that in some places have considerable horizontal extent and in others are limited to only a few feet. Many clay lenses are only a few feet to a few rods in extent, though in places they interlock with other lenses lying above and below them, and in that way present the appearance of a continuous bed, unless it is possible to examine a section in detail. In the sands cross-bedding and cross lamination are the rule rather than the exception, the layers of clay and pebbles in many places being inclined at high angles. Smooth, even bedding is comparatively rare except in the clay lenses."

The Pliocene (?) Series overlies most of the Catahoula formation in Grant and LaSalle Parishes, ranging in thickness from a few feet to over 120 feet. North of the Catahoula scarp (Kisatchie Wold) in LaSalle, as outlined by Bayou Funny Louis, the occurrence of these materials is essentially fragmentary and irregular. This may be due to the non-resistant character of the underlying Vicksburg and Jackson clays in that area. In Grant Parish, the occurrence of the Pliocene (?) sediments north of the Catahoula outcrop is irregular but somewhat more general as shown by the presence of the Pliocene (?) sediments covering the Vicksburg and Jackson materials almost entirely in the area between Summerfield, Montgomery, and Verda.

The sands and gravels of the Pliocene (?) Series supply most of the ground water used in this area. Large supplies have been developed from this source at Jena, Trout, Good Pine, Pollock, and Montgomery. The amount of water available, in general, seems to vary from north to south with the thickness of the formation. Small farm wells are usually successful wherever the thickness is not less than 20 feet. Water table conditions are present in most of the wells so that the water does not rise in the casing when the sand is penetrated.

Water from the sands and gravels of the Pliocene (?) Series is soft and has a small total of dissolved solids. The results of chemical examination of 9 water samples taken from wells drawing upon the Pliocene (?) sand and gravels showed a range in hardness from 5.9 to 51 parts per million and a range in chloride content from 2.6 to 46 parts per million. The total of dissolved solids ranged from 23 to 163 parts per million in the four samples in which this was determined.

PLEISTOCENE AND RECENT SERIES

The flood plains of the major drainages in Grant and LaSalle Parishes are blanketed with Pleistocene and Recent deposits. These deposits consist primarily of silt, clay, and sand with some gravel. The clay, which has a red color typical of the alluvium of the Red River, grades downward into fine sand and then into coarse sands and gravels with interbedded clay. The base of the coarse sand and gravel is often marked by the occurrence of carbonized wood. The thickness of the Plesitocene and Recent deposits ranges from a few feet to about 130 feet, apparently increasing somewhat southward.

Small domestic supplies of hard water may be obtained from the fine sands at depths from 30 to 60 feet. Larger supplies of water, such as that of the Town of Colfax, are available from the coarse sand and gravel found between 90 and 130 feet below the surface. This water is usually under little or no artesian pressure.

Sixteen samples of water from the Pleistocene and Recent sediments of Grant and LaSalle Parishes ranged in hardness from about 50 to over 600 parts per million with most samples exceeding 150 parts per million. The chloride content ranged from about 5 to over 600 parts per million. The higher amounts of chloride were found in the water from shallow wells in and near Colfax in western Grant Parish, where the Pleistocene and Recent sediments directly overly the basal sands of the Catahoula formation. The relatively small development of the Pleistocene water sands, in general, is probably due to the hardness of the water, as well as to an objectionable iron content.

Summary

Ground water constitutes the principal source of water used in Grant and LaSalle Parishes. It is obtained from wells that draw upon water sands of the Cockfield and Catahoula formations, and the overlying Pliocene (?) and Pleistocene sediments.

The Cockfield formation yields fresh water only in a small area in northwestern LaSalle Parish. This water is often highly colored and bad tasting. The only satisfactory supply is that at Olla.

The basal sand members of the Catahoula formation which outcrop in central Grant and LaSalle Parishes, contain brackish water. Other water sands higher in the section supply soft fresh water in southern Grant Parish, particularly in the Red River valley where a few flowing wells are found. The relatively small development of the Catahoula sands as a source of water in these Parishes is due primarily to the abundance of good water available from the shallower Pliocene (?) deposits.

Pliocene (?) sands and gravels blanket the highlands in this area. They range in thickness from a few feet to over 120 feet and generally yield sufficient water from small municipal and industrial supplies. Because of the softness of the water and the shallow depths of the sands, there are more wells drawing upon this source than on any other in the area.

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[34] Matson, G. C., The Pliocene formation of the Gulf Coastal Plain: U. S. Geol. Survey Prof. Paper 98 (L), pp. 167-192, 1916.

[35] Hilgard, E. W., Orange sand, Lagrange, and Appomattox: Am. Geol., vol. 8, p. 130, 1891.

[36] Howe, H. V., Review of Tertiary Stratigraphy of Louisiana: Am. Assoc. Pet. Geol., vol 17, no. 6, (June) pp. 648-665, 1933.

[37] Chawner, W. D., Op. cit., pp. 136-137, 1936.

[38] Fisk, H. N., Geology of Grant and La Salle Parishes: Louisiana Dept. Cons. Geol. Bull. 9, pp. 149-172, 1938.

[39] Matson, G. C., The Pliocene formation of the Gulf Coastal Plain: U. S. Geol. Survey Prof. Paper 98 (L), pp. 173-176, 1916.

Pleistocene and Recent sediments ranging from a few feet to about 130 feet in thickness cover the lowlands of the Parishes. These sediments, as in other parts of the State, yield hard water which contains a rather large amount of iron. This water is slightly brackish in the vicinity of Colfax in western Grant Parish, where the Pleistocene and Recent sediments directly overly Catahoula sands containing brackish water under artesian pressure.

◆

The Sex-Life of the Bass

[Continued from Page 15]

Perhaps at the first strike, if their father was a Phi Beta Kappa, the children will be awakened to the dangers of the world which they must face. But on the other hand, if not so smart and endowed with but an ordinary inheritance, the now savage father may have time for another strike, and perhaps yet one more. In any event, the remaining fry soon realize that the world is not one of milk and honey and perpetual parental care. By now, they realize that self-preservation is the first law of fish, too.

MORAL: The Wife will not be misled by the apparent domesticity of her husband, for lo, his patience may come to an end, and he may drive her from his home and devour the children.

◆

BENTONITE, NEWCOMER IN INDUSTRY, WIDELY USED

Bentonite, an odd sort of clay which swells greatly when wetted, promises to become the mineral of a thousand uses, says the Bureau of Mines. This extraordinary clay, which was hardly heard of a few years ago, is now produced in the United States to the extent of nearly 200,000 tons annually. Three plants were built last year in Mississippi and Alabama.

Bentonite is used in the manufacture of synthetic molding sand; for oil-well drilling mud; for bleaching petroleum products; in the manufacture of cement and ceramic products, soaps, refractory materials, paper, cosmetics, water softeners, sealing agents, paints, medicinal emulsions, and roofing; for de-inking newsprint and clarifying dry-cleaner fluids; as the core of earth-fill dams; and as lining for irrigation ditches. This list is far from complete, and new uses for bentonite are being found every year.

The Lure of the List

[Continued form Page 35]

responding in advance with local field observers, taking advantage of all forms of transportation, mostly unknown to Audubon (whose amazing pioneer "life-list" was somewhere around 500).

List-making, of course, has no pre-eminent scientific importance (though a recent article in BIRD-LORE throws new light on the value of establishing data on ranges as derived from many years of BIRD-LORE Christmas Censuses). The list-maker has often been mildly ridiculed by the scientific naturalist as a mere player of games, in this case "bird golf." But I suggest there is more to it than that. The bird student must acknowledge his debt to those who, from Audubon onward, have discovered and classified the birds. Without their work we should be looking at a haphazard lot of birds, with no order or inter-relationship. Yet the only common ground of the professional field naturalist, the hunter, and the amateur field observer, is, or ought to be, that all of them love the bird in nature, all of them are interested in the infinite variety of habits exhibited by this diverse group of God's creatures, and intrigued by the beauty of the bird in flight.

No one would desire to overemphasize list-making in itself; but I can only say that I would challenge anyone to find a pursuit which can bring more collateral joys and benefits. I find that seeing a wide variety of birds in all parts of the country intensifies rather than lessens one's interest in the birds of one's own door-yard. The year of the large list may then be followed by a period of quiet specialization, as evidenced by the accomplishment of Mrs. Nice in her extraordinary Song Sparrow studies.

During 1939 I had the fortune to see the Black-footed Albatross, four Shearwaters, the Pelicans, most of the Cormorants, Man-o'-war-birds, practically all the Egrets, Herons, Ibises, and Cranes, the Trumpeter Swans at Red Rock Lake in Wyoming, 35 varieties of Ducks, White-tailed and Everglade Kites, the Zone-tailed Hawk, Chachalaca, Sooty Grouse and Sage Hen, Surf-birds, and most of the lovely shore birds of both coasts, most of the Gulls and Terns, and a brilliant array of land birds, including the Coppery-tailed Trogon, and the gamut from Humming-birds to Eagles. Whatever a man may see or do in life, whatever he may achieve in the way of fame or earthly possessions, I feel sure that no experience could bring more permanent memories of life and beauty, or a closer feeling of kinship with the basic rhythm of the world of nature.

And I venture to predict that as the generations go on, an increasing number of Americans will find some pathway along which they can come closer to nature. Many believe that the troubles of our world today are at least in part due to the drift of men and women into increasingly artificial ways of life. After all, we are part of nature, and are evolved, along with birds, animals, and fishes, from primitive simplicity. Our roots, though invisible, are still in the earth. Mankind is like the giant Antaeus, who could never be conquered as long as he kept his contact with his mother earth. Hercules defeated him only when he lifted him into the air and divorced him from the source of his life and strength. The lure of the birds is one of the many invitations that nature issues to man to return to the vital and inexhaustible source of his life and power—and peace.

◆

NEON LIGHTS ATTRACT INSECTS TO TROUT PONDS

Submerged red-and-green neon lights to guide insects to a surer death have been installed as the newest type fish-food lure in the field of Federal trout hatcheries.

Although the use of light to attract flying insects to trout and other rearing ponds is nothing new, these novel colored subsurface beacons, now in use at the Spearfish (South Dakota) Station of the Bureau of Fisheries, have never been tried out elsewhere. Heretofore, hatcheries utilizing the light principle to supplement ordinary feeding procedures, have depended upon a simple drop-cord ending in a wide reflector from six to eight inches above the water surface Seeing the reflected glow, insects strike for the surface where they are captured by the fish.

Just what poundage of flying food has been recovered through the use of ordinary lights, or may be recovered by the new type, is not known. In any event, the procedure of using lights as a lure has been used in many hatcheries with apparently favorable results.

The new type submarine lures, perfected by J. F. Harrington, present foreman, and T. S. Kibbe, former foreman, of the Spearfish hatchery, are an improvement over the ordinary type light lures. Each of the slender neon tubes, about four feet in length, is equipped with specially developed underwater wiring and waterproof fittings. The red and green colors were not chosen with any thought that one might be more attractive than another to the insects, although it may be learned from the experiment that they actually have a preference.

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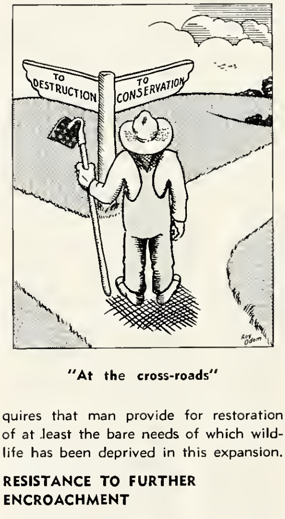
The Man with the Hoe

by
W. F. Chisholm

Long ago, some military strategist expressed himself to the effect that "the best defense is an attack." Study of state wildlife conservation policies reveals that most of them are merely defensive, a resistance built up against the the effects of harmful factors, rather than direct attacks on the harmful factors themselves. Static conservation policies have failed to meet the test. Dynamic conservation alone offers a way out.

Any study of fish and game conservation, any consideration of its principles and its history, brings out the fact that positive attack on the problem is the only method left to governmental authority. Continuation of a negative policy must mean only a continuation of the long series of failures and discouragements that have followed the conservationist from the time Moses (Deuteronomy 22:6) laid down the law that bird hunters should not disturb the "dam sitting upon the young ones, or upon the eggs." By a "negative policy" is meant a policy of "protection" with protection limited to restriction of hunting or fishing to certain seasons, to bag limits, or to size limits, and the establishment of "refuges." The negative policy has its origin in the attempts of the rulers of men to preserve for themselves an ample supply of game, by limiting hunting to their own group. The paramount fallacy in dependence on restrictive measures alone is the fact that such measures attack only single phases of the problem, and cannot be carried far enough to satisfy the needs of the fish and game population without sacrificing the actual needs of man himself.

Man's requirements are met by agriculture and industry. Both agriculture and industry adapt and utilize natural materials and natural processes to their own advantage. Such adaptation means a decrease in the amount of food, cover, and water provided by nature for fish and game. Restrictive measures limit to some extent the amounts of food, cover, and water that may be diverted from use by wildlife to use by man, and limit to some extent the percentage of each generation of wildlife that may be "taken" by man. The first limitation aids to some extent the conservation of the actual needs of the wildlife, the second, to some extent provides for the leaving of seed stock on the range and in the stream for the perpetuation of the various species. If one man or group of men takes from another, the law usually provides some means of compensation, but man expects to continue to take from wildlife its natural requirements without compensation of any kind. The progress of mankind requires continued expansion of agriculture and industry, but the actual survival of wildlife requires that man provide for restoration of at least the bare needs of which wildlife has been deprived in this expansion.



"At the cross-roads"

RESISTANCE TO FURTHER ENCROACHMENT

The positive method of attack on the problem of the conservation of fish and game involves, therefore, an attempt at restoration of some of the cover, food, and water, that man has destroyed, and a more or less rigid policy of resistance to any further unnecessary encroachment of man's activities on wildlife requirements in the few natural wildlife areas that now are left.

Man has made a feeble attempt to compensate for the damage done to wildlife by establishing "hatcheries" where a small amount of game and fish are hopefully raised at great expense to become the progenitors of a new wildlife race. The product of these hatcheries is dumped in the woods and fields and streams surrounded by conditions that wiped out its forebears, is turned loose in environments sometimes entirely foreign to the nature of the product.

Restrictive measures alone, or restrictive measures *and* hatchery programs are doomed to failure until man realizes that dumping more game and more fish into areas now unable to support what game and fish are left is like moving refugees from abandoned farms into an overcrowded city whose industry cannot provide support for its present population. Hatchery programs may furnish one small phase of a positive attack on the problem, but dependence on restriction and hatcheries only, still further hampers the struggle for existence among the wildlife population.

PROGRAM OF RESTORATION

What, then, remains to be done? First, there must be careful study of the food habits and cover requirements of the desired species; second, a thoroughgoing program of restoration of wildlife needs. The progressive farmer is proud of his clean-cut farm, of his modern wire fence rows along which even the grass is kept cut. He may have a fine woodlot kept clear of unsightly underbrush by annual burning. He has cleared his swampland by drainage, and dug wells to provide himself with water. But the coveys of quail that formerly nested in the underbrush near his woodlot and sought cover from the hawks in overgrown runways along the fencerows are gone. The stream that once coursed across his land all through the year, now flows intermittently, its rapid run-off during the rainy season eating further and further into his valuable crop areas. The fish that formerly rewarded his efforts along that stream are gone, most of them destroyed by the failure of the stream during dry seasons. The trees in his woodlot show signs of decay at their burned knees. The farmer is disappointed in nature, and calls on the government to build quail hatcheries where birds may be raised to replace his lost coveys in an environment where they cannot find protection or support; he calls for hatchery raised fish to be dumped into his streams—to live only until the first dry season finds them trapped in stagnant pools, dead from suffocation, or driven downstream to other waters, possibly to live in a more kindly environment,—possibly to starve in an overcrowded lake like the migrant farmer in the overcrowded city.

The farmer sees the hawks flying overhead, and blames them for the loss of his quail. He shoots down the hawks,—and the cotton rats formerly kept under control by the hawks, overrun his lands and destroy the nests of what few quail may be left.

THE VICIOUS CIRCLE

The farmer studies his agricultural magazines, and finds that the market for good beef is on the rise; he calls his friends and neighbors together and starts a movement to make grazing land by draining out the "useless" swamp area, that nobody "gets anything out of." The government listens to his appeal, the swamp is drained. In many cases the drained swamp areas do not make good grazing lands, and in most cases, the swamp lakes that teemed with fish and attracted sportsmen from great distances are dried up. The lakes are gone, the fish are gone, the revenue from guide-fees, and lunch money from the sportsmen is gone from the countryside, so he asks the government to build a dam to form a pond, to stock the pond with hatchery raised fish, all to replace the lakes and fish which he and his neighbors, with good intentions, of course, destroyed.

Why the farmer? True, he has probably innocently destroyed more upland game by clean farming and more fish by failure to control soil erosion and by unwise drainage, than any other factor involved in the destruction of natural environment. That, however, is not the reason for stressing here the activities of the farmer and his neighbors. Just as the farmer has been an important factor in the reduction of the formerly abundant wildlife, so too, is he the most important factor in its restoration. We have mentioned "a positive attack" on the problem. The farmer and his neighbors make up the combat troops to form the spear head of that attack. In his hands are the great upland game areas, in his hands the little game that is left; in his hands, too, are the gullies and the woodlots, and the hedgerows, and the fence corners which are the strategic points from which the attack must be launched.

The plan of attack is not new, it has been tried in some states, and has met with continuing success. The companies and the battalions of the attacking army are the farmer-sportsmen associations organized and operated for the purpose of restoring year by year more and more of the cover, food, and water necessary for the defense and support of the wildlife population.

With some of the money now spent on questionable restrictive measures, and on dubious hatching projects, the governmental authorities can support the intelligence staff of the attacking farmer-sportsmen armies. State-supported research can determine the needs, state-supported educational groups can carry the attack plan to the farmer-game units, and the state-sponsored, self-supporting units can carry out the program.

THE "LOST BATTALION"

One important consideration remains. An attacking army may sometimes find one of its units in the position of the "Lost Battalion." Some false move, some poorly planned step on the part of a particular unit may interrupt the whole campaign. Good game and fish environments depend upon a natural balance. Whatever action may be taken, all efforts must be directed toward restoration of balance rather than elimination of any particular *natural* factor which may be considered harmful. The game and the fish have come down through the ages, in abundance, in direct competition with natural predators. Under the protection of cover provided by nature, the game species survived and reproduced in the wilderness. The sickly quail was taken by the hawk, the stunted weakling among the fish became the prey of the gar, but the natural game thrived and increased. The healthy quail and the active trout remained to reproduce. Then man came into the area and unwittingly following the customs of his fathers, he proceeded to upset the natural balance. In clearing his land, he destroyed protection cover and food. In tilling the land, he allowed erosional forces to carry sand and silt too rapidly into streams and lakes. In building his cities he failed to provide for treatment of sewage. In developing his industrial plants, he did not stop to measure the harm done by his wastes. Every series of steps he took to his own advantage left a wake of unrecognized destruction. The sportsman took the game fish, the commercial fisherman took the commercial fish, and the state now raises young fish,—to feed the gar pike.

The natural solution of the fish and game problem is, then, to be found in a complete program with its principal effort laid on restoration of natural environment and restoration of natural balance among species. Some restrictive measures, and probably some hatchery programs should be continued, but the major effort must be centered on the restoration feature,—and the hope for success of the restoration feature lies in the hands of the farmer. The key to conservation progress rests in the pocket of the man with the hoe.

SPORT FISHING IS BIG BUSINESS

Devotees of Isaac Walton generated nearly $1,000,000,000 worth of business in the United States during 1939, Charles E. Jackson, Acting Commissioner of Fisheries, estimated in a report to Secretary of the Interior, Harold L. Ickes. Sportsmen spent $877,309,009 for fishing licenses, tackle, photography, transportation, guides, food, lodging, bait, boats and other necessities during 1938 according to a survey of their expenditures conducted by the Bureau of Fisheries. Some of the results shown were:

Expenditures for tackle and accessories made in the United States are estimated as $35,000,000. Creels of many descriptions and other articles under the title "tackle," as well as home-fashioned flies, rods, etc., are not included in that figure. Neither is live bait, which represents an industry of itself in several states.

Licenses fees paid to the State Fish and Game Departments represent less than one-eightieth of the anglers' total expenditures.

According to reports, anglers in the State of Oregon paid $1,000,000 in gasoline taxes the past year. In Texas they spent an estimated $1,250,000 for gasoline; $2,500,000 for groceries, meals at restaurants, and accomodations at hotels; $1,000,000 for bait, boats and guides; and $1,500,000 for clothing. Anglers at Freeport, Long Island, spent $1,000,000; and the trout fishermen at Apostle Island, Wisconsin, $75,000.

The total expenditures of the anglers in 1938 in Arizona was estimated at $959,550; California, $50,000,000; Indiana, $1,500,000; Maine, $41,171,441; Maryland, $1,500,000; Montana, $4,153,000; New Jersey, $1,632,150; North Carolina, $1,000,000; North Dakota, $70,000; Oregon, $20,000,000; Rhode Island, $175,000; Texas, $12,500,000 (including hunters); Utah, $3,072,769 (including hunters); Vermont, $400,000; and Washington (all tourists, a large part of whom fish), $7,721,625.

During the early settlement of New England the colonists ate whale meat on Friday and other fast days, believing the whale a fish, whereas it is a mammal. It was not until some time later that they learned they had failed to observe strictly these fast days.

■ The virgin pine forests of the past abounded in wild life, game and supposedly unlimited timber resources.

"Old-Timer" Learns His Forestry Lesson

by
V. H. Sonderegger

In the development of the forestry program in Louisiana, it is essential to have men who have had a thorough training in forestry practices and who are able to get along with the citizens of the forested areas to obtain the primary objective, forest fire prevention. Forest fires are an evil that will be with us for all time. These fires are caused by carelessness, and the majority by incendiarism. A small percentage of these fires are caused by lightning.

The Division of Forestry of the Department of Conservation has set a goal in saving ninety-nine per cent of the forest lands in its intensive protection work. At present 7,300,000 acres of cut-over and second-growth forest lands are under intensive protection. The records of the past ten years show that the average loss has been 1.5 per cent and once this loss went under the objective of 1.0 per cent.

The history of the State of Louisiana discloses that the Indians fired the woods at regular seasons. During the early days, the forests were of good size and did not need young seedlings underneath. The Indians used rather good judgment in burning the woods and this procedure took place during the winter months, a period when the trees were dormant and less susceptible to fire damage.

The object in burning the woods in those days was to get rid of the underbrush to protect the Indian villages, first, from incoming fires and, second, keeping the area clear against the approach of enemy tribes. The Indians also burned many spots to create a new growth which attracted a great deal of wild life, particularly deer and the turkey, in the early spring months. With the advent of the white man settling in Louisiana, this custom of burning the woods was followed for the same reasons; first, to protect the homeplace and agricultural lands from incoming fires; second, to keep the surrounding area open so that marauding Indians could be spotted; and, third, to attract wild life to the new green grasses at a period early in spring. Both agencies burned the woods in the same season, that is during the winter months. The damage was light, scarred many of the trees and reduced their growing volume temporarily. Forest fires are most detrimental in the spring and summer months when the sap is rising and the texture of the cambium layer is tender and easily damaged.

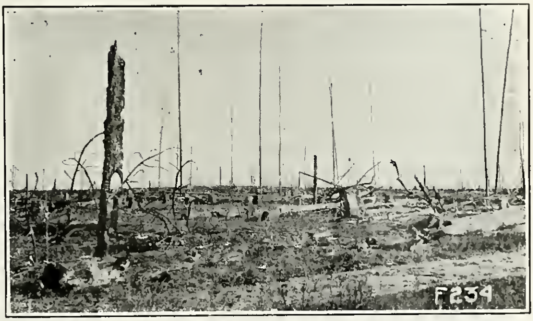
Probably one of the best sources of information I have is a citizen of the piney woods, whom I shall call "Old-Timer". This gentleman is 82 years of age and has operated a cross-roads country store for more than fifty years. The following information is gleaned from interviews with "Old-Timer" on my many visits to his place:

"My parents came from the East Atlantic Coast and settled in the piney woods of Louisiana just before the Civil War. My father has often talked about the wonderful timber stand and the abundant supply of wild life, especially deer, turkey, and squirrel, which were available then. The soil sustained our table with all of the vegetative products needed, and the farm abounded in poultry and livestock. Father said when he first settled here, before I was born and during the time I was a young child, that we lived on the fat of the land.

"Whenever it was necessary to obtain material and specialities for the home, the ox team was hitched up and we drove to the river towns to exchange our commodities for cash and such items as we needed in the house, especially medicines, hardware, cloth and other personal articles. The items of exchange consisted of livestock and hides from our cattle, as well as furs from the mink, otter, and coon.

"About fifty years ago, approximately in the year 1890, I inherited my father's country store and started in business, exchanging the commodities of the farm and forest for the staple mercantile articles. The sawmills at that time started up and the inflow of new citizens took place. Business picked up and I became one of the largest mercantile dealers in the area. Sawmills and railroads were the most important payrolls. New railroads were constructed and sawmills were built after the railroads came in. All of the neighboring farmers increased their agricultural products and were able to sell them direct to the consumer or through the store for cash or barter, and my store in turn sold these articles to the employees of the industrial activities. Instead of hauling my products of the soil and forests to river towns on the long trek with ox-carts, I was able to sell most of my products to the industrial employees in my parish and ship out by rail the products, such as furs, livestock and other products which could not be consumed locally.

"Business boomed and taxes were low. Sawmills and other forest products insti-



—Photo taken in 1920.

■ The sawmills cut out and the cutover lands were neglected, permitting them to burn over annually and producing no revenue whatever.

tutions were operating night and day. Our citizens became enthused with the wealth and income of the parishes. Without regard for the future, bonds were issued for many useful roads and also some useless roads. Bonds were issued for bridges and school buildings, and for any other public improvements that were half-way needed.

"About that time, if my memory serves me right, around the year 1915, you, as a forester, came to my place and discussed the problems of the timber supply. We all laughed at your ideas and theories, as we had very little knowledge of what a forester was or what a forester could do. You were acceptable to us, as you were of assistance to our community in many ways, but we could not accept your logic and your plea to get the landowners to cooperate and supervise the cutting of their virgin forests. You have been laughed at and have taken it on the chin many a time in our community for talking to us personally, or to our school children and police juries, on the seriousness of Louisiana's future timber supply.

"Well, the industries kept on going. We kept on making money, and I was putting money in the bank. Right after the World War, probably a couple of years, we suddenly realized the seriousness of the timber situation and the predictions you had made. Three sawmills closed out in our parish overnight, abandoned their operations, turned the sawmill hands off, and either retired from business or migrated westward. The result was depletion of our citizens who worked at the sawmills and who had been our cash customers. Our own people who had worked between farm seasons at the sawmills and in the woods were left high and dry, with no cash revenue and no local market for their products. My mercantile operations suffered in consequence, and my bank account dwindled. My cash business was gone and my credit business increased to a point where I had to buy my commodities for cash and sell them to my neighbors for credit. The lands were cut-over and bare, and the landowners permitted their lands to burn without any responsibility or even a thought of protecting the young timber which was coming up. With business gone to pieces, with our local people out of public works employment, and with no activity existing, we were facing a rather difficult problem. To make our problem worse, we suddenly realized that the timber assessments on which our bonds were based had disappeared and the property owners remaining in the parish had become liable for the bonds as they were due. I know of two wards in different parishes whose millage jumped from 50 mills to 260 mills, and in another ward the millage went to 320 mills, due to this condition. This added hardships and many of the small farm owners picked up their chattels and moved to other sections, letting their lands go to the state for taxes which were exorbitant.

"In 1930 I was considered to be an old man, seventy years of age. I had been prosperous and, although not broke, I had very little to show. With all of these trials and tribulations of the people of the forested areas, we had the depression follow and this was the last straw both from a mercantile operation and from the citizens' standpoint of living conditions. They became destitute. In the meantime, your organization of forestry employees had been constantly hammering away on forest fire protection and developing a future timber supply. In discussing the problems of the State of Louisiana with my many customers, I found quite a few of the citizens were protecting their timber supply and working with the Division of Forestry as fire wardens. I cashed some of their checks each month, which was the major cash income I had.

"Right after the depression a great many of the farmers in my parish, as well as other parishes, who had protected their timber against fires, were cutting pulpwood and were able to sustain themselves. This harvesting of protected forest crops during the depression made us realize how negligent we were for the past thirty years in not protecting our timber and not using proper methods of timber removal. I know it is late but not too late, and you can rest assured that not only the influence of myself but the cooperation of the community will be put forth towards helping

■ **With the advent of sawmills, the communities and the state at large enjoyed vast industrial payrolls.**

Progressive landowners and the citizens realized "idle lands pay no revenues". Twenty years of forestry have rehabilitated idle lands to new timber crops and cattle ranges.

you to create new forests for a continuous operation in the future."

This conversation with my "Old-Timer" friend is typical of the expressions of many of the citizens in the forested areas.

The Division of Forestry up to the present time has done what I believe to be a remarkable piece of work rehabilitating the cut-over lands to grow forests for the future. Approximately 10,000,000 acres of land are in a productive condition with proper supervision. Seven million acres are left to be supervised and these lands are in a fair growing condition and from every indication will be under protection and forestry practice within the next four years.

The tax assessments in the forested parishes are all showing an increase. New paper mills have been constructed, creosote plants have expanded, and new sawmills have moved in. Not only are they paying their share of taxes, but are issuing large cash payrolls which have alleviated the mercantile and professional financial interests with cash incomes, thereby increasing the taxable assets.

The programs of forestry has passed its hardest points, and is now on the road to successful perpetual operations. The financial condition in the protected forest areas has improved materially and the farmers are self-supporting. However, the one issue we have overlooked is the fact that it takes fifteen years of intensive forest fire protection work to grow a forest to the age of safety as well as the beginning of liquidation. The factor we had overlooked is the forgotten farmer in the piney woods region. He is assured that the taxable values will be increased by the new timber crops, but he is not taken care of while he is waiting for the timber crops to mature and he has become destitute because he is only able to exist on his small farm and has no cash income because there are no public works available.

The State of Louisiana, through its Division of Forestry funds and Federal funds, gives steady employment the entire year to approximately five hundred forest fire wardens and patrolmen, who reside on the small farms in the piney woods and whose duties are to protect the forests against fires and suppress any and all fires that may occur. For this service a fire warden is paid $250.00 per year, payable $20.00 per month for eleven months and $30.00 for the month of December. Although this money does not seem to be a large salary, it has been the means of alleviating a great deal of destitution in a financial way. This small sum of money has been the means of furnishing the farmers with manufactured commodities, such as hosiery, shoes, medicines and other items that have to be purchased.

The landowners of the state have assisted materially in aiding the small farmers in the forests by giving them work in cutting and hauling pulpwood.

The United States Government, through the Civilian Conservation Corps, has operated over twenty CCC forestry camps with the Division of Forestry. In the majority these boys were enrolled from the small farms throughout the state. These boys received $8.00 per month for their spending money, and $22.00 per month was sent to their parents. This forest labor again has relieved the acute financial condition existing.

During the period 1939 and 1940, the Division of Forestry, through state appropriations, has maintained a vast amount of CCC projects which were constructed and turned over to the state. Between the farming seasons, the Divisions of Forestry employs the farmers in the forested areas on road work, repairing bridges and culverts, and maintaining the CCC projects. These citizens are employed with a rate pay of thirty cents per hour for a forty-hour week.

Forest maintenance and fire protection reaches the highest peaks from October 15 to March 15 which is the idle time of the year for farmers, and we are proud to state that we have employed a large number of these individuals who have averaged from $48.00 to as high as $150.00 each during this idle period.

The problem of forestry is a two-fold one. First, to rehabilitate the cut-over lands to a new stand of timber perpetuating the forests for the future. Second, to take care of the citizens in these forested areas. The Federal Government has started the Resettlement Administration, buying out small farmers and moving them to more fertile lands with the hope that they can rehabilitate themselves with the new conditions. Unfortunately, this program has not developed in accordance with the theories advanced. The people of the piney woods in particular, and in the forested areas of the state in general, love their homes and farms. They cannot be removed to strange settlements as their sentiments are wrapped up in their homeplaces and this dates back to their forefathers who first settled these lands.

In my humble opinion, our objective should be to rehabilitate the farmer on his own place by giving him public work, that is, a cash income, and helping him to work and produce the right crops under the best agricultural methods.

"Old-Timer" expressed himself freely and gave a very good solution when he said, "Keep all of the non-agricultural lands in full productivity with forest products. Have all of the forest lands create public works or cash incomes for the farmers who live in these areas and who can work between the crop seasons. Help the farmer with his problems; show him the best ways to produce a crop on his lands where he will at least break even or make a small profit."

I can agree with "Old-Timer", and in my opinion I believe with all of our development and with all of our forest projects, we have overlooked the forgotten man of the forest and he needs a new forest to work on so that he can get additional cash revenue, and he needs agricultural advice and help to bring his homestead to a place where he can have three good meals a day, a place to sleep, and a cash income to maintain himself with the necessities of life. When this is done the destitute rolls will shrink. Not only will the number of destitute be reduced, but the forest industrial activities of the state will be increased.

Louisiana is assured of a continuous timber crop for the future. Louisiana has room for many manufacturers for refabrication of forest products materials. We can supply lumber, pulp and paper, spanish moss and other by-products of the forest that exist.

Continuous forest products production, continuous forest products industrial payrolls, will give the citizens of our forested area prosperity, health and contented homes.

* * *

Soft Crabs --and Hard

[Continued from Page 14]

a regular coalman's scoop. Buy one. I believe they're for sale made that way. Go down to the lakeshore. Push it along in front of you in the thick grass, in shallow water. Sooner or later you'll hit a crab. He'll dart out. The "greener" he is the faster he'll dart. Grab him. But you've got to be fast—or tricky, for Mr. Crab has his little bag plenty full of tricks himself. It takes some time, but you'll learn.

Keep all but the "clears", "paper-shells" and "busters." The first two are no good to eat; the last don't keep alive out of water. It's a waste to keep them.

"SCOOPING" AT NIGHT

And if your eyes are good and your skin mosquito-proof, you could try scooping at night, with a torch. That takes two men; one carries the torch. Tightly wrapped rags soaked in a mixture of lube oil and kerosene and wired to a stout rod make first class torches for this kind of sport. Take a half dozen or so along. Sometimes you'll see only the crabs eyes, for at night they often bury in mud. Poke them out of the grass. You'll catch soft crabs at night. But try hard not to step on a stingaree. A friend of mine mistook one for a flounder once. He never did bother to come back for his scoop net.

Then there is the "bush" method. But that isn't used much around here, not even by the professional crabbers. Too much grass for the shedding crabs to bother finding a haven in your "bushes". However, if you care to try it, cut a couple dozen four foot lengths of thickly leaved willows. Tie these overboard. Scoop slowly underneath them the next morning. There might be a crab hiding there. Some fishermen even bait their "bushes". "Green" crabs feed. "Busters" and soft ones do not.

So that's that, with only a parting word or two more. "Doubles" are considered prizes. Around here they come twice a season, early around May and then in September. These are their mating periods. Catch a double and you have a quick shedding she crab and a nice fat male. The former, however, hardens quickly, becomes a tough-looking "cow-crab" and then hurries off to sea. Or at least so I've heard people talking.

"Don't they bite?" I've heard this silly question so often. Ladies seem to take a delight in asking it. "Why, sure they bite. They're crabs, aren't they?" And the only way to get used to them is to get bit often enough. That or quit. I've seen some mighty good crab fishermen running around with their tootsies in bandages.

Take a soft crab out of water and he stops hardening. Put him on ice and he'll stay soft several days. Only be careful how you handle him.

Some people tell me that boiled "busters" are the most tasteful delicacy of the lot. Ever try them? At this stage Mr. Crab is a pinkish, sluggish, puffy sort of fellow. You may catch one as a "double" in your drop net. But don't put him (her, rather) in the basket with the other crabs. That's no place for a lady "buster". Take a pot, fill it with lake or bayou water. Put the crab in that and take her home that way. A soft crab just out of the shell and still wrinkled is the best for frying. It hasn't stretched yet. It's solid; no water in it at all. Hang around some fisherman while he's overhauling his boxes and ask him to sell you one. You may hit him at the right time.

* * * * *

So drive down to the lake some nice summer's day. Don't choose a hurricane. I've known "sports" to do just that. Along the bayou edges, in the lagoons, in the lake. Try your luck.

* * *

The most highly poisonous fishes are certain tropical toadfishes. They have hollow, syringe-needlelike spines, on the opercules and back, at the base of which poison glands are located. The spines take the place of fangs in poisonous snakes. While the venom from these fish apparently has never proved fatal to man, it has made some persons quite sick.

No real substitute has yet been found for asbestos, according to the Bureau of Mines. In the heat-insulation field, glass wool and other products afford competition, but asbestos still is deemed indispensable for automobile brake-bands and clutch facings.

Hell-benders which in the water resemble nothing so much as an old sock filled with mud, have lungs but rely chiefly on their skin for respiration.

Oil and Gas Wells Completed in South Louisiana During 1st Quarter of 1940

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Gravity	Total Depth
ABBEVILLE (Vermilion Pr.)	Continental Oil Co.	C. Franciol #1	2/8/40	701.40	1/4	39.6	7,909
ANSE LA BUTTE (St. Martin Pr.)	Glassell & Glassell	Marie P. Breaux #1	2/5/40	275.40	12/64	38.6	5,685
	Iberia Petroleum Corp.	Moresi A-1	3/10/40	331.20	1/4	25.3	2,478
BANCROFT (Beauregard Pr.)	Republic Production Co.	J. W. Whitman-Cline #2	1/9/40	209.00	3/16	43.2	7,325
	Republic Production Co.	Columbia L. & T. Co. #14	1/13/40	209.00	3/16	43.7	7,287
	Republic Production Co.	G. F. Hennigan #2	2/16/40	180.00	3/16	43.4	7,330
	Republic Production Co.	Lutcher Moore Lbr. Co. #4	2/25/40	160.00	3/16	45.1	10,019
	Republic Production Co.	Columbia L. & T. Co. #16	3/6/40	241.00	3/16	42.3	7,288
	Republic Production Co.	Columbia L. & T. Co. #15	3/16/40	273.00	3/16	41.2	7,295
BARATARIA (Jefferson Pr.)	Gulf Refining Co.	J. Rathborne E. Lease #1	1/30/40	676.00	1/4	37.4	8,210
BAYOU BLUE (Iberville Pr.)	The Superior Oil Co.	Schwing L. & S. Co. #1	2/4/40	326.00	11/64	33.1	6,802
BAYOU CHOCTAW (Iberville Pr.)	Standard Oil Co. of La.	Wilbert M. G. #12	1/15/40	75.00	9/64	29.2	3,826
BAYOU PIGEON (Iberia Pr.)	Plymouth Oil Co.	Lynch McHugh Heirs #1	3/27/40	712.80	1/4	35.2	10,021
BLACK BAYOU (Cameron Pr.)	Shell Oil Co., Inc.	Mrs. J. B. Watkins #43	1/14/40	522.00	15/64	29.2	5,519
CAILLOU ISLAND (Terrebonne Pr.)	The Texas Co.	State Caillou Island #63	1/21/40	248.00	3/16	32.2	4,122
	The Texas Co.	State Caillou Island #62	1/26/40	355.68	3/16	31.7	5,955
	The Texas Co.	State Caillou Island #65	3/24/40	48.00	3/16	42.6	6,021
	The Texas Co.	State Caillou Island #64	3/28/40	65.00	3/16	31.3	5,790
CHACAHOULA (Lafourche Pr.)	Sun Oil Co.	Dibert, Stark & Brown #8	1/30/40	633.00	1/4	32.8	7,298
	Sun Oil Co.	Dibert S. & B. #7	3/30/40	818.00	1/4	33.2	7,400
CHALKLEY (Cameron Pr.)	Shell Oil Co., Inc.	K. B. Hanszen #6	1/25/40	964.80	1/4	37.8	8,951
	Humble Oil & Rfg. Co.	K. B. Hanszen #6	3/27/40	324.00	3/16	36.9	8,650
CHARENTON (St. Mary Pr.)	Pan American Prod. Co.	Laws Realty Co. #19	1/1/40	98.36	Gas Lift	19.9	1,163
	Techeland Oil Corp.	W. C. Hertel et al #10	1/3/40	215.28	Open	20.0	1,134
	Pan American Prod. Co.	E. J. Robicheaux #15	1/4/40	66.24	Gas Lift	19.9	1,156
	Pan American Prod. Co.	Robicheaux #16	1/13/40	215.29	Gas Lift	19.9	1,164
	H. J. DeArman et al	Landry #6	1/17/40	292.44	Pumping	......	965
	H. J. DeArman et al	Landry #10	1/18/40	540.00	1/2	......	965
	Hamill Smith & DeArman	Landry #13	2/5/40	372.60	Open	19.0	961
	Hamill Smith & DeArman	Simoneaux #11	2/6/40	40.44	Open	19.0	875
	Pan American Prod. Co.	E. J. Robicheaux #17	2/7/40	66.24	Open	19.0	954
	St. Mary Oil Co.	Achee #7	2/14/40	64.80	Open	20.1	1,173
	Pan American Prod. Co.	E. J. Robicheaux #18	2/16/40	165.60	Open	19.4	960
	Hamill Smith & DeArman	Kern #10	2/22/40	81.00	Open	20.1	1,168
	Pan American Prod. Co.	E. J. Robicheaux #19	2/26/40	140.76	Gas Lift	19.7	....
	Pan American Prod. Co.	H. Ecuer A-7	3/10/40	397.44	Gas Lift	20.1	1,158
	Pan American Prod. Co.	A. Veeder Co., Inc. #20	3/13/40	149.04	1/4	20.6	1,256
	Pan American Prod. Co.	H. Ecuer #A-5	3/15/40	31.20	Gas Lift	19.4	1,150
	Pan American Prod. Co.	Ecuer et al B-6	3/20/40	31.20	1/4	19.4	965
	Pan American Prod. Co.	A. Veeder Co., Inc. #21	3/21/40	74.52	Open	19.6	1,250
	St. Mary Oil Co.	Hertel "A" Tr. 8 #4	3/22/40	182.16	Open	20.5	1,169
CHENEYVILLE (Rapides Pr.)	S. W. Richardson	Weil Co., Inc. #8	1/1/40	326.00	3/16	36.6	5,764
	S. W. Richardson	Weil Co., Inc. #9	2/20/40	324.60	3/16	37.0	6,591
	S. W. Richardson	Weil Co., Inc. #10	3/10/40	260.00	3/16	35.0	5,782
CREOLE (Cameron Pr.)	The Superior Oil Co.	Gulf of Mex-State #10	2/22/40	313.20	3/16	34.0	6,725
DARROW (Ascension Pr.)	Humble Oil & Rfg. Co.	Humble-Comm. #28	3/12/40	130.00	9/64	30.1	4,649
DELTA FARMS (Lafourche Pr.)	Tidewater Associated Oil Co.	Tidewater Associated Oil Co. La. Delta Farms #1	3/21/40	440.00	1/4	33.0	11,851
EAST HACKBERRY (Cameron Pr.)	Union Sulphur Co.	Simon Doiron #2	1/22/40	561.96	3/16	30.4	7,255
	Harrison Oil Co. & J. S. Abercrombie Co.	Ambrose M. Doiron #1	3/21/40	722.28	12/64	29.5	7,323
	Stanolind Oil & Gas Co.	Cameron Parish Sch. Board	3/29/40	292.68	5/32	29.6	9,337
ENGLISH BAYOU (Calcasieu Pr.)	The Union Sulphur Co.	O. H. Castle #1	2/10/40	390.24	22/64	41.7	7,093
	Fohs Oil Co.	M. P. Erwin B-1	2/23/40	105.48	1"	40.8	7,061
EOLA (Avoyelles Pr.)	Amerada Petroleum Corp.	Heirs P. Glaze et al #6	1/2/40	689.40	1/4	43.0	8,570
	Amerada Petroleum Corp.	Heirs P. Glaze et al #7	1/5/40	786.60	1/4	43.0	8,570
	Sid W. Richardson	A. Mizer #1	1/6/40	478.92	1/4	43.0	8,572
	Amerada Petroleum Corp.	Dent et al Unit #1	1/14/40	596.16	1/4	43.7	8,573
	Amerada Petroleum Corp.	R. Z. Sclater #1	1/17/40	695.52	1/4	42.3	8,583
	G. R. Kennedy	Eola-Irion #1	1/17/40	551.82	1/4	44.0	9,568
	Amerada Petroleum Corp.	Mrs. E. O. Sellers #1	2/1/40	890.96	1/4	44.0	8,571
	S. W. Richardson	Haas Inv. Co. #8	2/3/40	777.36	1/4	44.0	8,590
	Amerada Petroleum Corp.	Giglio #1	2/5/40	879.00	1/4	44.0	8,579
	Amerada Petroleum Corp.	Mrs. L. B. Dent #2	2/13/40	881.12	1/4	43.0	8,575
	Amerada Petroleum Corp.	Glaze #8	2/21/40	697.32	1/4	43.4	8,570
	Sun Oil Co.	E. A. Townsend #3	2/28/40	639.00	1/4	43.0	8,572
	Gulf Refining Co.	M. F. Mouliere #1	3/2/40	665.00	1/4	43.6	8,570
	Amerada Petroleum Corp.	Mrs. L. B. Dent #3	3/10/40	535.32	1/4	45.0	8,575
	Amerada Petroleum Corp.	Mrs. Felix S. Monchau et al	3/13/40	678.96	1/4	44.0	8,573
	S. W. Richardson	Haas Inv. Co. #10	3/13/40	621.84	1/4	44.0	8,576
	Amerada Petroleum Corp.	Mrs. L. B. Dent A-1	3/16/40	637.56	1/4	45.0	8,570
GARDEN ISLAND BAY (Plaquemines Pr.)	The Texas Co.	Garden Island Bay #41	2/18/40	453.00	3/16	34.9	6,404
	The Texas Co.	Garden Island Bay #40	2/20/40	496.00	3/16	38.0	5,757
	The Texas Co.	State-Garden Island Bay #42	3/27/40	248.00	3/16	29.5	5,749

Oil and Gas Wells Completed in South Louisiana During 1st Quarter of 1940

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Grav-ity	Total Depth
GOLDEN MEADOW (Lafourche Pr.)	Berkshire Oil Co.	Joe Nicol et al #2	1/7/40	246.00	9/64	36.0	5,177
	Mar-Tex Oil Corp.	Rebstock Community A-2	1/8/40	168.00	10/64	36.0	5,222
	Taylor Fithian	Sidney Rebstock #1	1/9/40	25.00	Pumping	26.0	.. ....
	The Texas Co.	LL&E #8	1/14/40	293.00	12/64	37.0	7,940
	The Texas Co.	Falgout Hdlg. Co. #9	1/21/40	379.00	12/64	36.0	5,175
	Mar Tex Oil Corp.	Rebstock Community B-1	1/23/40	192.00	10/64	36.0	5,364
	The Texas Co.	Falgout Hdlg. Co. #10	1/24/40	374.00	10/64	38.7	7,940
	Berkshire Oil Co.	Joe Nicol et al #11	1/25/40	162.00	1/4	36.0	2,677
	The Texas Co.	La Terre Co. #4	1/26/40	147.73	5/32	27.2	2,683
	Mar-Tex Oil Corp.	Rebstock Community B-2	1/29/40	65.00	10/64	26.0	2,691
	M. H. Marr & G. H. Vaughn	Adam Terrebonne #3	2/1/40	130.00	12/64	37.0	5,500
	Temple Hargrove	Gaspard & Rizan #2	2/5/40	175.00	9/64	38.2	8,654
	George E. Lilly	Jack Collins #1	2/6/40	240.00	8/64	36.0	5,500
	Jim McMurray Prod. Co.	P. Collins #2	2/9/40	162.00	8/64	36.0	5,516
	The Texas Co.	State-Catfish Lake #6	2/16/40	195.00	3/16	26.8	2,675
	The Texas Co.	Falgout Hdlg. Co. #7	2/19/40	518.00	3/16	38.7	7,940
	The Texas Co.	LL&E-GM #9	2/21/40	325.00	12/64	36.0	5,175
	The Texas Co.	Falgout Hdlg. Co. #11	3/3/40	421.00	12/64	36.0	5,176
	Mar-Tex Oil Corp.	Rebstock C-1	3/4/40	168.00	12/64	36.0	5,226
	Berkshire Oil Co.	Ex Malgom et al #1	3/6/40	250.00	16/64	26.0	2,670
	S. Rhodes	Falgout Hdlg. Co. #4	3/8/40	192.00	10/64	36.0	5,210
	Temple Hargrove	Gaspard-Rizan #3	3/10/40	50.00	Gas Lift	26.0	2,664
	Marr & Vaughn	Adam Terrebonne #4	3/11/40	192.00	12/64	36.0	5,175
	The Texas Co.	La. Terre Co. #3	3/12/40	1,028.00	1/4	38.3	10,395
	Berkshire Oil Co.	Xavier Malgom et al #2	3/15/40	360.00	16/64	26.0	2,666
	The Texas Co.	LL&E #10	3/19/40	255.00	10/64	35.5	5,345
	Mar-Tex Oil Corp.	Rebstock Community A-4	2/23/40	216.00	11/64	36.0	5,210
	Berkshire Oil Co.	Nicol et al #14	3/31/40	320.00	16/64	36.0	5,175
GRAND BAY (Plaquemines Pr.)	Gulf Refining Co.	G. P. L. D. A-5	1/1/40	780.00	1/4	36.8	8,754
	Gulf Refining Co.	G. P. L. D. A-6	1/25/40	792.00	3/16	37.6	10,453
	The Texas Co.	St. Lookout Pass #2	3/4/40	406.50	3/16	36.3	10,342
GRAND LAKE (Cameron Pr.)	Superior Oil Co.	Grand Lake State #6	1/21/40	291.60	11/64	33.1	8,991
	Amerada Petroleum Corp.	Mallard Bay #3	2/21/40	397.68	3/16	33.2	9,004
	The Superior Oil Co.	Grand Lake State #7	3/2/40	291.60	12/64	33.7	8,990
	Superior Oil Co.	Grand Lake State #8	3/20/40	275.60	10/64	32.9	8,991
	Amerada Petroleum Corp.	Mallard Bay #5	3/23/40	340.80	5/32	33.8	8,422
HORSESHOE BAYOU (St. Mary Pr.)	The Texas Co.	St. Mary Ph. Ld. Co. #3	2/5/40	340.92	11/64	38.1	10,867
IBERIA (Iberia Pr.)	Canal Oil Co.	Sabatier #7	1/12/40	11.04	Open	21.3	3,090
	The Texas Co.	J. P. Duhe #14	2/1/40	777.60	1/4	31.3	5,989
	The Texas Co.	J. P. Duhe #15	3/8/40	518.40	1/4	26.2	4,287
	William Helis	Bolivar #12	3/15/40	24.84	Open	20.0	1,202
	The Texas Co.	Perry Wallet et al #1	3/23/40	25.52	Open	35.0	9,116
IOWA (Calcasieu Pr.)	Shell Oil Company, Inc.	F. Heyd #31	1/5/40	494.00	1/4	25.3	4,469
JEFFERSON ISLAND (Iberia Pr.)	The Texas Co.	Jeff. Salt Mng. Co. #4	3/24/40	340.20	13/64	34.4	8,646
JEANERETTE (St. Mary Pr.)	Herton Oil Co.	S. B. Roan #6	2/7/40	364.00	7/32	36.9	10,471
JENNINGS (Acadia Pr.)	Stanolind Oil & Gas Co.	Crowley O. & M. #116	2/4/40	255.48	3/16	33.3	8,323
	Shell Oil Co., Inc.	Conover Community #9	2/24/40	373.00	3/16	39.1	7,634
LAFITTE (Jefferson Pr.)	The Texas Co.	Madison A-5	1/9/40	915.12	1/4	38.4	10,188
	The Texas Co.	Rigolets Co-Op Fur Co. #12	2/5/40	642.00	1/4	36.7	10,189
	The Texas Co.	Leo A. Merrero et al #5	2/26/40	803.00	1/4	38.4	10,180
	The Texas Co.	State Bayou Norman #3	3/24/40	473.00	3/16	37.7	10,139
LAFOURCHE CROSSING (Lafourche Pr.)	Mikton Oil Co.	Martinez #2	3/1/40	60.00	1/8	52.5	11,000
LAKE PELTO (Terrebonne Pr.)	The Texas Co.	State Lake Pelto #29	1/12/40	152.52	1/8	27.9	5,743
LAPICE (St. James Pr.)	Shell Oil Co., Inc.	Lebermuth & Israel Realty Co. #1	1/20/40	40.00	12/64	48.6	11,402
NEALE (Beauregard Pr.)	Atlantic Refg. Co.	D. A. Whitmer #1	3/25/40	421.20	3/16	36.6	8,615
NIBLETTS FARMS (Jefferson Davis Pr.)	Continental Oil Co.	Nibletts Farms #1	3/29/40	80.25	1/16	41.0	11,748
NORTH CROWLEY (Acadia Pr.)	Humble Oil & Refg. Co.	A. Ohlenforst #6	1/14/40	811.44	1/4	35.0	8,810
	Humble Oil & Refg. Co.	Ohlenforst #5	1/21/40	779.04	1/4	34.5	9,080
	Humble Oil & Refg. Co.	J. B. Stokes #4	2/12/40	415.50	3/16	35.0	8,867
	Humble Oil & Refg. Co.	F. Williams #7	3/16/40	421.92	3/16	35.2	8,813
	Humble Oil & Refg. Co.	P. J. Reiners #1	3/17/40	421.92	3/16	35.0	8,991
PARADIS (St. Charles Pr.)	The Texas Co.	LL&E Paradis #3	3/20/40	941.68	1/4	37.7	11,555
PORT BARRE (St. Landry Pr.)	McDannald Oil Co.	S. W. Futrall #2	3/17/40	241.76	10/64	37.8	5,584
	The Texas Co.	Botany Bay Lbr. Co. #27	3/21/40	707.16	1/4	37.9	6,523
POTASH (Plaquemines Pr.)	Humble Oil & Refg. Co.	Orleans Levee Board #42	3/27/40	373.00	1/4	26.8	7,954
QUARANTINE BAY (Plaquemines Pr.)	Gulf Refining Co.	Orleans Levee Board A-4	1/22/40	356.00	3/16	31.0	8,255
	Gulf Refining Co.	La. State QQ #9	2/25/40	274.00	1/4	37.1	8,175
	Gulf Refining Co.	La. State QQ #12	3/26/40	545.68	3/16	34.3	8,562
ROANOKE (Jefferson Davis Pr.)	Humble Oil & Rfg. Co.	Martin Kratzer #7	2/6/40	406.80	1/4	40.3	7,945
SWEETLAKE (Cameron Pr.)	The Pure Oil Co.	Yount Lee #15	3/26/40	285.00	12/64	35.2	7,200

Oil and Gas Wells Completed in South Louisiana During 1st Quarter of 1940

Field	Name of Company	Name of Well	Date Completed	Daily Initial Production	Size Choke (Inch)	Grav-ity	Total Depth
UNIVERSITY (East Baton Rouge Pr.)	Titanic Oil Co.	Denis Duplantier #1	1/1/40	225.00	10/64	36.0	6,484
	William Helis et al	Nelson #7	1/21/40	214.00	10/64	36.0	6,485
	William Helis et al	Duplantier B-4	1/29/40	253.00	11/64	..	6,500
	Lisbon Iberia Oil Corp.	College Town Subdivision A-3	2/8/40	240.00	12/64	36.1	6.513
	William Helis et al	Duplantier C-2	2/14/40	275.00	11/64	36.1	6,500
	William Helis et al	Nelson #8	3/13/40	243.00	10/64	36.1	6.477
	Lisbon Iberia Oil Corp.	University Hills #3	3/27/40	249.60	8/64	35.0	6,510
VENICE (Plaquemines Pr.)	Tidewater Associated Oil Co.	Manhattan L&F Co. #11	1/28/40	224.00	1/8	31.7	7,820
VILLE PLATTE (Evangeline Pr.)	Continental Oil Co.	J. E. Ludeau M. Haas #7	1/1/40	456.00	1/4	41.6	8,991
	Continental Oil Co.	J. E. Vidrine Tr. 2 #4	1/8/40	933.60	1/4	42.8	9,106
	Continental Oil Co.	J. E. Vidrine Tr. 16 #1	1/12/40	800.40	1/4	39.6	10,427
	Continental Oil Co.	Hattie Haas #4	1/14/40	120.00	1/4	45.6	10,393
	Continental Oil Co.	W. L. Tate #2	1/15/40	460.80	1/4	40.6	10,582
	Continental Oil Co.	Fontenot-Desbotels #2	1/20/40	506.40	1/4	42.6	10,310
	Continental Oil Co.	Opelousas-St. L. Sec. Co. #6	1/30/40	565.00	1/4	41.6	9,168
	Continental Oil Co.	A. M. Fontenot Tr. 2 & 3 #5	2/2/40	462.00	1/4	41.7	8,996
	Continental Oil Co.	W. L. Tate #3	2/12/40	642.00	1/4	42.9	9,033
	Danciger Oil & Rfg. Co.	J. E. Vidrine #1	2/19/40	535.56	1/4	42.7	10,226
	Continental Oil Co.	Oscar Pitre #5	3/10/40	396.00	1/4	39.8	9,040
	Continental Oil Co.	Mrs. B. G. Fontenot #2	3/17/40	571.40	1/4	41.6	9,024
	Continental Oil Co.	M. R. D. Tate #1	3/18/40	510.80	1/4	44.2	10,235
	Continental Oil Co.	A. M. Fontenot Tr. 2 & 3 #6	3/19/40	398.04	1/4	46.8	9,013
	Continental Oil Co.	Martha Haas #5	3/26/40	544.60	1/4	39.4	9,094
WEST GUEYDAN (Vermilion Pr.)	Magnolia Petroleum Corp.	J. B. Ferguson #4	1/17/40	97.56	3/8	64.7	7,161
WEST HACKBERRY (Cameron Pr.)	The Superior Oil Co.	Raymond Vincent #2	2/16/40	453.60	12/64	40.8	8,260
WHITE CASTLE (Iberville Pr.)	Shell Oil Co., Inc.	Wilbert #15	1/19/40	150.00	16/64	27.0	6,900
	Shell Oil Co., Inc.	Forest Home #1	3/22/40	514.00	1/4	27.5	6,618
WOODLAWN (Jefferson Davis Pr.)	Union Sulphur Co.	E. A. Norton #2	3/4/40	276.80	10/64	39.2	8,127
	Woodlawn Oil Corp.	Jos. Hebert et al #1	3/8/40	106.40	1/4	58.3	9,541

Oil and Gas Wells Completed in North Louisiana During 1st Quarter of 1940

CADDO (Caddo Pr.)	J. I. Roberts & C. H. Murphy	Caddo O. & M. Co. #1	2/12/40	30.00	Open	34.0	1,518
	Roger Harris	Lane-Evans #1	2/25/40	65.00	Open	38.7	1,525
COTTON VALLEY (Webster Pr.)	Hunt Oil Co.	Stewart et al #4	1/4/40	596.16	15/64	48.0	8,648
	Stanolind Oil & Gas Co.	Pardee Co. #4	1/5/40	292.32	3/16	....	8,576
	Hunt Oil Co.	Stewart et al #3	1/6/40	480.24	1/4	50.0	8,893
	Quad Oil Co.	A. H. Gray #1	1/9/40	264.00	1/4	52.0	5,677
	Quad Oil Co.	A. H. Gray #2	2/15/40	95.20	Open	52.0	5,777
	Quad Oil Co.	Gray #3	3/23/40	264.96	1/4	....	5,677
	Hunt Oil Co.	Robert Gains #1	3/24/40	215.28	18/64	59.8	8,671
	Hunt Oil Co.	Jordon #1	3/24/40	361.80	3/16	47.5	8,604
MONROE (Morehouse Pr.)	Union Producing Co.	Tensas-Delta A-1	2/6/40	2¼ MCF*	....	......	10,475
	Southern Carbon Co.	Tensas-Delta #27	3/11/40	1½ MCF	....	......	2,225
	Southern Carbon Co.	Tensas-Delta #28	3/28/40	1¼ MCF	....	......	2,194
MONROE (Union Pr.)	H. L. Woods, Trustee	Union Power Co. #2	1/2/40	2¼ MCF	....	......	2,212
	United Carbon Co.	W. P. McKenner #1	1/9/40	¾ MCF	....	......	2,203
	United Carbon Co.	L. & E. Reppond #1	1/9/40	½ MCF	....	......	2,380
	Memphis Nat'l. Gas Co.	Frost Lbr. Ind. #7	1/11/40	¾ MCF	....	......	2,202
	Memphis Nat'l. Gas Co.	Edwards #2	1/17/40	3 MCF	....	......	2,188
	We Hope Oil & Gas Co.	Frost Lbr. Ind. #9	1/26/40	2 MCF	....	......	2,215
	Southern Carbon Co.	Grayling #35	1/30/40	8 MCF	....	......	2,150
	Memphis Nat'l. Gas Co.	Lankford #4	2/12/40	¾ MCF	....	......	2,200
	Memphis Nat'l. Gas Co.	Lankford #9	2/12/40	1¾ MCF	....	......	2,200
	We Hope Oil & Gas Co.	Frost Lbr. Ind. #11	2/19/40	1¾ MCF	....	......	2,215
	H. L. Woods, Trustee	Union Power Co. #3	2/23/40	2¼ MCF	....	......	2,210
	Memphis Nat'l. Gas Co.	Wilson #1	3/8/40	2¼ MCF	....	......	2,200
	Memphis Nat'l. Gas Co.	Lankford #5	3/11/40	1¼ MCF	....	......	2,198
	Memphis Nat'l. Gas Co.	J. B. Lankford #1	3/26/40	1¼ MCF	....	......	2,153
PINE ISLAND (Caddo Pr.)	Roy I. Davis	Hanna #1	1/28/40	10.00	Open	38.0	1,480
	Magnolia Petro. Corp.	Dillon #30	2/21/40	70.00	Open	41.1	1,625
	Joe H. Strahan	J. J. Hart #2	2/21/40	35.00	Open	44.0	2,390
RODESSA (Caddo Pr.)	Sultana Drlg. Co., Inc.	B. N. Bain et al A-2	1/1/40	166.00	1/2	43.0	6,082
	M. M. Travis et al (Red Iron Drlg. Co.)	Chandler #2	1/18/40	240.00	1/4	44.0	6,097
SHREVEPORT (Caddo Pr.)	C. H. Lyons	La. Real Est. & Dev. Co. #1	1/15/40	66.00	1/4	......	5,562
	Robert Manziel et al	City of Shreveport #1	3/4/40	165.00	22/64	43.0	5,575
SLIGO (Bossier Pr.)	Triangle Drilling Co.	Schuler et al A-2	2/23/40	70.00	Gas Lift	......	3,112
SUGAR CREEK (Claiborne Pr.)	Sugar Creek Syndicate	Mrs. Flora Robinson #1	2/9/40	250.00	16/64	31.0	5,816
TULLOS (LaSalle Pr.)	W. B. Jarvis	Montague Oil Co. #A-2	1/3/40	100.00		21.0	1,504
URANIA (LaSalle Pr.)	Graham & Harter	Urania Lbr. Co. Ltd. #4	3/5/40	40.00	Open	21.0	1,519
ZWOLLE (Sabine Pr.)	The Hunter Co.	Sabine Lbr. Co. B-3	3/2/40	33.00	Open	39.0	2,138
	Major Oil Co.	Sabine Lbr. Co. B-2	3/8/40	28.00	Open	42.0	2,475
	P. C. Alexander	Tilley #1	3/12/40	124.00	Open	41.0	2,560

* MCF—As used in this table for convenience, means—Million Cubic Feet of Gas.

ANALYSES OF LOUISIANA CRUDE OILS

Analyses of crude oils produced by the Louisiana fields have been collected by James E. Halligan, statistician, with the co-operation of David B. McConnell, director of the Minerals Division; John G. Huffman, engineer of the Shreveport District; C. M. Fontenot, manager, and H. A. Metzger, engineer of the Lake Charles District; E. J. Hagstette, Jr., engineer of the Lafayette District; and J. J. Metzger, Jr., engineer of the Houma and New Orleans districts.

The following analyses of the crude oils of the Golden Meadow field is presented as an example of the detail of Mr. Halligan's survey. Readers of the Review who may be interested in some particular field are advised to write the Department of Conservation, New Orleans, La., for information similar to that contained in the analyses of Golden Meadow.

The Golden Meadow Field is located in Lafourche Parish. The total production for 1939 was 745,766 barrels. In December 1939 there were 55 producing wells in this field.

OIL: CRUDE	State Catfisb Lake #2. Completed 7/23/39. Depth: 2,775′. Daily Production, 252 bbls.	Golden Meadow #3. Completed 9/27/39. Depth: 7,940′. Daily Production, 391 bbls.	La Terre #2. Completeo 9/2/39. Depth: —— Daily Production, 355 bbls.
Gravity	27.8	38.1	42.9
Flash-C.T.	....	....	....
Flash-O-Cleve.	240	—60	—60
Fire	280	—60	—60
Viscosity @ 60° Ther. Say. @ 97/100 @	....	42/100	36/100
Color—Eye	Green	Green	Green
Color	....	....	....
Pour—°F	—0	30	20
BS&W	0.1 %	0.5 %	0.2%
Tar	10%	6%	2%
Acid No.	....	....	...
Car. Res.	...	...	....
Sulfur	0.20%	0.10%	0.16%
Octane No.	L-3	L-3	L-3
Hydrogen Sulfide Odor	....	....	..
Wax Cloud-Lubg. Dist.	....	....	.
Diesel Index	....	....	

DISTIL.:	TEMP.	GRAV.	TEMP.	GRAV.	TEMP.	GRAV.
I.B.P.	310	....	142	....	120	....
5%	494	36.2	262	77.3	200	75.6
10%	519	35.1	325	56.0	238	67.7
15%	538	34.6	358	52.3	262	61.8
20%	554	34.1	396	49.3	300	57.4
25%	565	33.6	440	45.9	326	54.9
30%	586	33.2	464	44.5	354	52.2
35%	604	32.4	500	42.5	394	49.4
40%	622	31.8	523	41.5	431	47.3
45%	639	31.0	549	40.1	464	45.2
50%	660	30.4	567	38.8	492	43.1
55%	684	30.0	591	37.4	533	41.3
60%	706	28.8	618	36.0	560	39.0
65%	728	28.6	648	34.8	588	37.9
70%	743	27.5	675	33.9	624	35.4
75%	752	27.3	702	33.1	654	35.2
80%	......	....	720	32.4	694	34.1
85%	......	....	742	31.6	730	32.6
90%	......	....	756	30.0	760	+31.3
95%	......	....	......	....	......	....
E.P.	......	....	......	....	......	....
Pour (675°-750°F.)	......	0% Rec.	......	80% Rec.	.....	80% Rec.

"GASPARD REIZON #1"

CHARACTERISTICS OF CRUDE OIL

Gravity, API @ 60° F	38.6
Flashpoint—C.O.C	Atmospheric
Color	Light Green
Sulfur—ASTM D 129-34	.13%
Viscosity—Say. Univ. @ 100° F.	39″
Pourpoint—ASTM 97-34	20° F.
Tar—Italian Railway	4.0%
B.S.&W.—By Centrifuge	Nil.
Odor	Sweet

ENGLER DISTILLATION

Intial Boiling Point	172° F.
5.0% Recovered @	243° F.
10.0% Recovered @	290° F.
20.0% Recovered @	390° F.
30.0% Recovered @	454° F.
40.0% Recovered @	511° F.
50.0% Recovered @	567° F.
60.0% Recovered @	624° F.
70.0% Recovered @	690° F.
80.0% Recovered @ Cracked	740° F.

8,000 cc charged to Saybolt Laboratory still. Gasoline and kerosene determined through tower by fire. Vacuum used after taking off gasoline and kerosene. Barometric 766 mm hg and vacuum pressure 760 mm hg.

	GASOLINE		KEROSENE		GAS OIL	LUBE DISTILLATE	RESIDUE
	350 EP	400 EP	FR. 350 EP	FR. 400 EP			
Yield	14.0%	20.4%	24.4%	18.0%	35.3%	13.8%	11.9%
Gravity—API @ 60° F.	60.7	56.7	45.0	43.5	36.2	29.7	22.9
Color—Saybolt	+25 Say.	+23 Say.	+18 Soy.	+14 Say.	1½NPA	2½NPA	D. Brown
Doctor	O.K.	O.K.	O.K.	O.K.	....	....	....
Corrosion	O.K.	O.K.	O.K.	O.K.	....	....	....
Viscosity—S.U. @ 100° F.	....	....	....	....	43"	132"	....
Viscosity—S.U. @ 210° F.	....	....	....	....	....	43"	148"
Flashpoint	....	....	128 TCC	162 TCC	265 PM	405 COC	540 COC
Firepoint	....	....	....	....	....	465 COC	610 COC
Pourpoint—ASTM D97-34	....	....	....	....	25° F.	90° F.	115° F.
Sulfur—ASTM	.03%	.034%	.05%	.06%	.095%		
Octane—ASTM	55	44	....	....	....		
Vapor Pressure	4.8 Lbs.	4.1 Lbs.	(Reid @ 100° F.)		....		
Aniline Point	....	....	....	....	189° F.		
Diesel Index	....	....	....	....	68.4		
Initial Boiling Pt.	121° F.	134° F.	353° F.	402° F.	510° F.		
5.0% Recovered @	165° F.	181° F.	364° F.	410° F.	532° F.		
10.0% Recovered @	180° F.	202° F.	370° F.	414° F.	543° F.		
20.0% Recovered @	202° F.	228° F.	381° F.	420° F.	553° F.	LOSS 0.6%	
30.0% Recovered @	217° F.	248° F.	392° F.	427° F.	563° F.		
40.0% Recovered @	232° F.	266° F.	404° F.	434° F.	573° F.		
50.0% Recovered @	244° F.	280° F.	419° F.	440° F.	586° F.		
60.0% Recovered @	254° F.	294° F.	432° F.	447° F.	590° F.		
70.0% Recovered @	264° F.	309° F.	444° F.	456° F.	616° F.		
80.0% Recovered @	280° F.	323° F.	460° F.	470° F.	637° F.		
90.0% Recovered @	297° F.	340° F.	489° F.	492° F.	665° F.		
End Point	353° F.	397° F.	538° F.	542° F.	714° F.		
Recovery	98.0%	98.5%	98.0%	98.0%	98.5%		
Residue	0.7%	0.5%	1.4%	1.6%	1.0%		
Loss	1.3%	1.0%	0.6%	0.4%	0.5%		

RECAPITULATION

Approx. Yields

(1)		(2)	
350 EP Gaso.	14.0%	400 EP Gaso.	20.4%
Kero. Fr. 350	24.4%	Kero. Fr. 400	18.0%
Gas Oil	35.3%	Gas Oil	35.3%
Lube Dist.	13.8%	Lube Dist.	13.8%
Residue	11.9%	Residue	11.9%
Loss	0.6%	Loss	0.6%
	100.0%		100.0%

"LAFOURCHE SCHOOL BOARD #1"

CHARACTERISTICS OF CRUDE OIL

Gravity—API @ 60° F.	37.3
Flashpoint—C.O.C.	Atmospheric
Color	Brownish Green
Sulfur—ASTM D129-34	0.16%
Viscosity—Say. Univ. @ 100° F.	41"
Pourpoint—ASTM 97-34	35° F.
Tar—Italian Railway	4.0%
B.S.&W.—By Centrifuge	0.2%
Odor	Sweet

ENGLER DISTILLATION

Initial Boiling Point	194° F.
5.0% Recovered @	310° F.
10.0% Recovered @	360° F.
20.0% Recovered @	433° F.
30.0% Recovered @	487° F.
40.0% Recovered @	527° F.
50.0% Recovered @	568° F.
60.0% Recovered @	614° F.
70.0% Recovered @	675° F.
80.0% Recovered @ Cracked	749° F.

8,000 CC charged to laboratory still. Gasoline and kerosene determined through tower by fire. Vacuum used after taking off gasoline and kerosene. Barometric 763 mm hg and vacuum pressure 760 mm hg.

	GASOLINE		KEROSENE		GAS OIL	LUBE DISTILLATE	RESIDUE
	350 EP	400 EP	FR. 350 EP	FR. 400 EP			
Yield	9.9%	16.2%	27.4%	21.1%	35.0%	14.4%	12.7%
Gravity—API @ 60° F.	58.3	53.9	43.4	42.2	36.2	30.3	20.9
Color—Saybolt	+25 Say.	+24 Say.	+19 Say.	+18 Say.	1½NPA	2½NPA	D. Brown
Doctor	O.K.	O.K.	O.K.	O.K.	....	....	....
Corrosion	O.K.	O.K.	O.K.	O.K.	....	....	....
Viscosity—S.U. @ 100° F.	....	....	....	....	43"	113"	....
Viscosity—S.U. @ 210° F.	....	....	....	....	....	41"	128"
Flashpoint	....	....	139 TCC	166 TCC	270 PM	385 COC	515 COC
Firepoint	....	....	....	....	....	425 COC	600 COC
Pourpoint—ASTM D97-34	....	....	....	....	25° F.	80° F.	120° F.
Sulfur—ASTM	.012%	.014%	.017%	.021%	.033%		
Octane—ASTM	64	58	....	....			
Vapor Pressure	3.2 Lbs.	2.7 Lbs.	(Reid @ 100° F.)		....		
Aniline Point	....	....	....	....	185° F.		
Diesel Index	....	....	....	....	70.0		
Initial Boiling Pt.	136° F.	153° F.	353° F.	406° F.	518° F.		
5.0% Recovered @	182° F.	198° F.	372° F.	414° F.	541° F.		
10.0% Recovered @	194° F.	223° F.	380° F.	418° F.	547° F.		
20.0% Recovered @	212° F.	243° F.	390° F.	424° F.	555° F.		
30.0% Recovered @	225° F.	258° F.	400° F.	430° F.	561° F.	LOSS 0.6%	
40.0% Recovered @	233° F.	272° F.	410° F.	435° F.	570° F.		
50.0% Recovered @	242° F.	285° F.	422° F.	440° F.	580° F.		
60.0% Recovered @	252° F.	300° F.	433° F.	446° F.	594° F.		
70.0% Recovered @	262° F.	314° F.	444° F.	453° F.	608° F.		
80.0% Recovered @	275° F.	329° F.	456° F.	463° F.	628° F.		
90.0% Recovered @	291° F.	346° F.	472° F.	479° F.	657° F.		
End Point	355° F.	402 F.	514° F.	520° F.	705° F.		
Recovery	98.0%	98.0%	98.0%	98.0%	98.0%		
Residue	0.7%	0.8%	1.4%	1.6%	1.5%		
Loss	1.3%	1.2%	0.6%	0.4%	0.5%		

RECAPITULATION

Approx. Yields

(1)		(2)	
350 EP Gaso.	9.9%	400 EP Gaso.	16.2%
Kero. Fr. 350	27.4%	Kero. Fr. 400	21.1%
Gas Oil	35.0%	Gas Oil	35.0%
Lube Dist.	14.4%	Lube Dist	14.4%
Residue	12.7%	Residue	12.7%
Loss	0.6%	Loss	0.6%
	100.0%		100.0%

EDITORIAL

With western Europe gone mad, ravaged by the engines of death and destruction, it is no easy matter to turn our thoughts from the tragic news of scare headlines and radio broadcasts. Nor should we try to escape the added responsibility imposed on us by the heart-rending events of that burning hell overseas.

Indeed, there is no escape. But in the midst of reverberations from the battle-fields of Europe, and our own accelerated pace towards national defense, we may pause to offer up a prayer of gratitude that here in America we are the beneficiaries of the intrepid spirit of our pioneer ancestors, that we have inherited natural resources which make our country the world's most formidable nation—resources which may yet stay the iron hand of the aggressor.

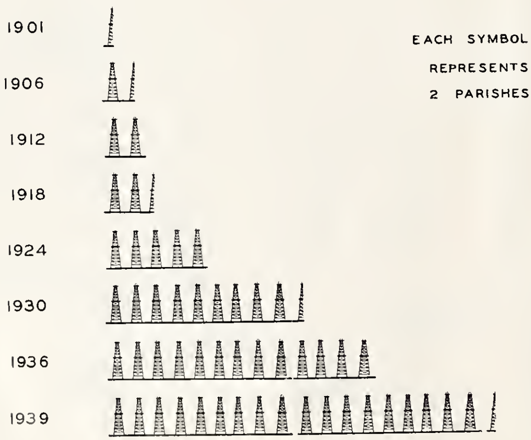
These resources, when converted by the inventive genius of our industrial age into the machinery of war, will serve as a warning to those who have no regard for human rights or for anything else except the show of brute force; and America may serve once more its peace-time mission in helping to rehabilitate a Europe in ruins.

If there is any moral in this for the conservationist, it is that we should have a greater respect for those resources that are the bulwark of our physical strength. Nature was so generous with the New World that man in his short-sighted enterprise did not foresee that there might come a day of reckoning, that the rich resources of this continent were not inexhaustible; but in recent decades there has been an awakening of the public conscience which brings a halt to the waste and dissipation of our extravagent youth as a nation. The public is now being educated to an appreciation of conservation in its relation to our social well-being.

Some of our resources may be renewed and replenished; but that is not true of our mineral resources, our crude oil and natural gas, and here it is necessary that we safe-guard our future needs by a wise conservation of production and consumption.

If America is to continue to hold aloft the beacon light of a free people, and maintain their free institutions, if it is to continue to offer a haven of refuge to the stricken and oppressed of the Old World, it is imperative that we take stock of our natural resources, which will provide the raw materials for those products of industry that not only serve the purposes of our national defense but also insure a strong arm and a resolute spirit when this war-racked world turns to us for material assistance and the inspiration to rebuild the edifice of civilization from its dying embers.

SPREAD OF LOUISIANA OIL PRODUCTION
BY PARISHES



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WILD VALETS

The Custer wolf, one of the most notorious of animal outlaws, once had two servants. A few weeks after his mate died, two coyotes attached themselves to the wolf that plagued Wyoming stockholders for years until he was finally exterminated by a Government hunter.

These coyotes flanked all the Custer wolf's movements, giving warning of danger. When he ate, the coyotes hung back and waited until he had finished, before devouring what was left of the prey.

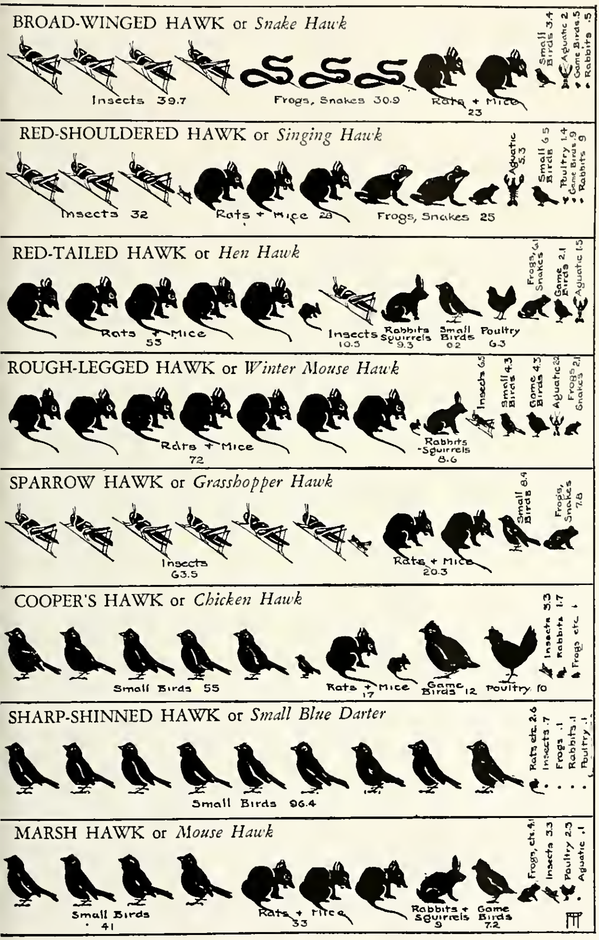
A resident anglers' license in Louisiana costs but one dollar, a non-resident two dollars. All anglers should provide themselves with a license at this inexpensive cost and avoid the possibility of a fine or confiscation of rod and reel. Pole and line fishermen need no license, nor do those anglers under fifteen years of age.

HAT
AWKS
AT

Our Wildlife is in Your Hands

Nature has a place and a need for every Native Hawk. They are all part of our wildlife, and each plays an essential part in regulating the abundance of the animals on which they prey.

Based on studies by the U. S. Department of Agriculture, covering contents of 5,185 hawk stomachs. (See U.S.D.A. Circular No. 370, "Food Habits of Common Hawks," published 1935, price 5c, from Supt. of Documents, Washington, D. C.)



KNOW YOUR HAWKS

TRY TO INCREASE THE ONES THAT ARE NEEDED TO HELP US PRESERVE HEALTHY BALANCES IN OUR WILDLIFE POPULATIONS.

MOUSE HAWKS

SOARING IN CIRCLES
PERCHING IN OPEN
LARGE SIZE
TAMENESS
SLOW FLIGHT
WIDE WINGS
SHORT, BROAD TAIL

FALCONS

RAPID FLIGHT
LONG, POINTED WINGS
DEEP WING STROKE
STREAMLINED SHAPE

BIRD HAWKS

FLAP AND GLIDE FLIGHT
PERCHING UNDER COVER
DIRECT RAPID PURSUIT
SMALL SIZE
LONG TAIL
SHORT, BLUNT WINGS

MARSH HAWK

LOW COURSING FLIGHT
LONG WINGS AND TAIL
HIGH WING ANGLE

Species With Simple Feeding Habits:

ULTURES	These useful scavengers eat only dead animals.
ALD EAGLE	Our National Emblem is such a slow and heavy flier, that it lives chiefly as a scavenger, eating fish, carrion, and any sick or crippled birds and animals it is able to catch.
SPREY	Lives entirely on fish, chiefly non-commercial varieties that swim near enough to the surface to be caught.

Species That Are Generally Very Rare:

GOSHAWK	A northern Hawk, coming south only in certain years. Eats poultry, game, rabbits, squirrels and mice.
DUCK HAWK	Eats shore birds, sparrows, and other non-game birds. Now very rare. Don't shoot it!
PIGEON HAWK	Eats small birds and insects. Is never common, and is too small to harm game.

Additional copies and further information may be obtained from the National Association of Audubon Societies, 1775 Broadway, New York, N. Y.

nted in U. S. A.

The Fourteenth Biennial Report of the Department of Conservation is the most complete and comprehensive yet published on the natural resources and wildlife of Louisiana.

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DEPARTMENT OF CONSERVATION

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